DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

Kolhapur Institute of Technology's College of Engineering Kolhapur(Empowered Autonomous)

KOLHAPUR INSTITUTE OF TECHNOLOGY'S COLLEGE OF ENGINEERING KOLHAPUR (EMPOWERED AUTONOMOUS)

Department of Civil and Environmental Engineering

Curriculum and Syllabus for

Final Year B. Tech. Civil and Environmental Engineering

(As Per NEP, 2020)

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DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

ABOUT THE DEPARTMENT

Kolhapur Institute of Technology's College of Engineering (Autonomous), Kolhapur is the only Institute in Maharashtra offering B. Tech in Civil and Environmental Engineering (04 Years Duration). Department offers M. Tech Program in Environmental Engineering (02 Years Duration) and it also has Ph.D. Research Centre in Environmental Engineering approved by Shivaji University, Kolhapur. Department is Accredited by National Board of Accreditation (NBA), New Delhi. Department of Civil and Environmental Engineering of KIT CoE, Kolhapur has been imparting education and training in all aspects of sustainable environment. The students undergo an academic program based on necessary fundamental concepts and major thrust areas of Civil Engineering and emphasizing on domains of Environmental Engineering such as, Water and Wastewater Engineering, Air and Noise Pollution Control, Solid and Hazardous Waste Management, Hydraulics, Environmental Management System, Environmental Impact Assessment and Legislation, Environment Health and Safety, Environmental Sanitation, Geospatial Technology, Renewable Energy Resources, Environmental Sustainability etc.
Department has PAN India Consultancy. Faculties and students are actively involved in several projects funded by various funding agencies and industries. The department has very good infrastructure equipped with necessary facilities and laboratories. Teaching learning process is effective by use of MOODLE and ICT based education. Student progress is monitored by effective mentoring and feedback system. Department offers B. Tech (Hons.) Civil and Environmental Engineering with Specialization in Green Technology and Sustainability Engineering, Project Based Learning, Business Club Activity, Soft Skill Development Programs, Student – Alumni Dialogues Initiatives as well as Value Added Programs. Department has a very strong alumni base spread all over the world as well as very good industry-institute connect through which training, internship and placement opportunities are provided to the students. The department has very strong student-support system.

DEPARTMENT VISION

To develop as a center of excellence in Civil and Environmental Engineering Education.

DEPARTMENT MISSION

M1:	To impart essential technical knowledge, skills and Environmental ethics.
M2:	To develop professional capabilities to meet changing societal and industrial needs.
M3:	To build up base for Research and Consultancy activities.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO1:	Solve Civil and Environmental Engineering problems and pursue higher studies using solid foundation in mathematics, science and technology.
PEO2:	Design, execute and operate various Civil and Environmental systems in related fields through participative education.
PEO3:	Develop skills to communicate effectively and work in a team in multidisciplinary areas.
PEO4:	Respond to the challenges of issues of Civil and Environmental Engineering through research and development.

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PROGRAMME OUTCOMES (PO)	
PO1:	Apply knowledge of mathematics, natural science, computing, engineering fundamentals and engineering specialization for solution of complex problems of Civil and Environmental Engineering.
PO2:	Identify, formulate, review research literature and analyze complex Civil and Environmental Engineering problems reaching substantiated conclusions with consideration for sustainable development.
PO3:	Design creative solutions for complex Civil and Environmental Engineering problems and develop system components to meet identified needs with consideration for public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.
PO4:	Conduct investigations of complex Civil and Environmental Engineering problems using research-based knowledge including design of experiments, modeling, analysis and interpretation of data to provide valid conclusions.
PO5:	Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modeling, recognizing their limitations to solve complex Civil and Environmental Engineering problems
PO6:	Analyze and evaluate societal and environmental aspects while solving complex Civil and Environmental Engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.
PO7:	Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national and international laws.
PO8:	Function effectively as an individual, and as a member or leader in multi-disciplinary teams.
PO9:	Communicate effectively and inclusively within the engineering community and society at large, through oral presentations and written reports and design documentation, considering cultural, language, and learning differences.
PO10:	Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage Civil and Environmental Engineering projects in multidisciplinary environments.
PO11:	Recognize the need for and have the preparation and ability for independent and life-long learning to engage in contemporary and emerging technologies and thinking in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSO)	
PSO1:	Identify and analyze the pollution related problems generated due to urbanization and industrialization.
PSO2:	Interpret the data using various tools and techniques to provide effective and applicable solutions.

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As per NEP Guidelines											
Proposed Scheme of Credit Distribution											
	Year	**FY**		**SY**		**TY**		**B. Tech.**			
Sr. No.	**Curriculum Components**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Actual**	**NEP Guidelines**
1	Basic Science Courses **(BSC)**	8	8							**16**	**14-18**
2	Engineering Science courses **(ESC)**	10	3							**13**	**12-16**
3	Programme Core Courses **(PC)**		3	16	15	10	11	11		**66**	**44-56**
4	Programme Elective courses **(PEC)**					3	3	3	6	**15**	**20**
5	Multi Minor **(MM)**			2	3	3	3	3		**14**	**14**
6	Open elective **(OE)**					3	3	2		**8**	**8**
7	Vocational and Skill Enhancement course **(VSEC)**	1	3		1	1				**6**	**8**
8	Ability Enhancement Course **(AEC)**		3				1			**4**	**4**
9	Entrepreneurship /Economics/ Management courses (Mgt/Economics/Mkt/Finance) **(HSSM)**			2		2				**4**	**4**
10	Indian knowledge system **(IKS)**	2								**2**	**2**
11	Value Education course **(VEC)**			2	2					**4**	**4**
12	Research Methodology (Project) **(RM)**							4		**4**	**4**
13	Comm. Engg Project/Field Project (PBL/Seminar/Mini Project) **(CEP)**					1	1			**2**	**2**
14	Project **(PP)**								4	**4**	**4**
15	Internship/OJT (PBL/Seminar/Mini Project/Virtual Internship/Physical) **(OJT)**			1	1				6	**8**	**12**
16	Co-curricular Courses **(CC)**		1		1		1		1	**4**	**4**
		20-22	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**174**	
		21	**21**	**23**	**23**	**23**	**23**	**23**	**17**	**174**	

B. Tech. Civil and Environmental Engineering
Regulation 2024-25

SEMESTER-I

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component			
1.	BSC	UHSBS0101	Engineering Mathematics-I	3	1	-	4	4	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2.	BSC	UHSBS0108	General Physics and Optics	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3.	ESC	UHSES0109	Engineering Mechanics	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
4.	ESC	UHSES0110	Basic Mechanical Engineering	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
5.	ESC	UHSES0111	Introduction to Python Programming	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
6.	BSC	UHSBS0128	General Physics and Optics Lab	-	-	2	2	1	ISE	50	20	
7.	ESC	UHSES0129	Engineering Mechanics Lab	-	-	2	2	1	ISE	50	20	
8.	ESC	UHSES0130	Basic Mechanical Engineering Lab	-	-	2	2	1	ISE	50	20	
9.	ESC	UHSES0131	Introduction to Python programming Lab	-	-	2	2	1	ISE	50	20	
10.	VSEC	UHSVS0132	Workshop Practice Lab	-	-	2	2	1	ISE	50	20	
11.	IKS	UHSIK0136	Ecology, Energy & Environment	2	-	-	2	2	ISE	100	40	
Total:							**26**	**21**	**Total Marks: 800 Total Credit: 21**			

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SEMESTER-II

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component			
1.	BSC	UHSBS0201	Engineering Mathematics-II	3	1	-	4	4	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2.	BSC	UHSBS0212	Applied Chemistry	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3.	AEC	UHSAE0203	Communication Skills	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
4.	ESC	UHSES0213	Basic Civil Engineering	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
5.	PC	UHSPC0214	Fundamentals of Electrical Engineering	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
6.	BSC	UHSBS0233	Applied Chemistry Lab	-	-	2	2	1	ISE	50	20	
7.	AEC	UHSAE0222	Communication Skills Lab	-	-	2	2	1	ISE	50	20	
8.	ESC	UHSES0234	Basic Civil Engineering Lab	-	-	2	2	1	ISE	50	20	
9.	PC	UHSPC0235	Fundamentals of Electrical Engineering Lab	-	-	2	2	1	ISE	50	20	
10.	VSEC	UHSVS0238	Computer Aided Engineering Drawing	-	-	2	2	3	ISE1 ISE2 ESE (POE)	25 25 50	 20	40
11.	CC	UHSCC0239	Co-Curricular Course	1	-	-	-	1	ISE	100	40	
						Total:	**24**	**21**	**Total Marks: 800** **Total Credit: 21**			

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SEMESTER-III

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component			
1.	PC	UCEPC0301	Computational Methods and Numerical Analysis	3	1	-	4	4	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2.	PC	UCEPC0302	Fluid Mechanics	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3.	PC	UCEPC0303	Solid Mechanics	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
4.	PC	UCEPC0304	Surveying and Geospatial Technology	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
5.	HSSM	UCEEM0305	Engineering Management	2	-	-	2	2	ESE	50	20	20
6.	VEC	UCEVE0306	Environmental Studies	2	-	-	2	2	ISE	50	20	20
7.	PC	UCEPC0331	Fluid Mechanics Laboratory	-	-	2	2	1	ISE ESE (POE)	25 25	10 10	
8.	PC	UCEPC0332	Strength of Materials Laboratory	-	-	2	2	1	ISE	25	10	
9.	PC	UCEPC0333	Surveying Laboratory	-	-	2	2	1	ISE ESE (POE)	50 25	20 10	
10.	OJT (CLPBL)	UCEIL0334	Building Planning and Design Laboratory	-	-	2	2	1	ISE	50	20	
11.	MM	*UCEMM0__	Multi-Disciplinary Minor	2	-	-	2	2	ESE	100	40	
						Total:	**27**	**23**	**Total Marks: 800** **Total Credit: 23**			

*UCEMM0341	Introduction to Data Science (MM-1)
*UCVMM0341	Basics of Projects and Automation (MM-1)
*UCEMM0342	Introduction to Management (MM-1)

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SEMESTER-IV

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component			
1.	PC	UCEPC0401	Building Construction Technology	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2.	PC	UCEPC0402	Environmental Hydraulics	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3.	PC	UCEPC0403	Structural Analysis	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
4.	PC	UCEPC0404	Hydrology and Water Resources Engineering	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
5.	PC	UCEPC0405	Environmental Chemistry and Microbiology	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
6.	VEC	UCEVE0406	Constitution of India	2	-	-	2	2	ISE	50	20	
7.	PC	UCEPC0431	Material Testing Laboratory	-	-	2	2	1	ISE ESE (OE)	25 25	10 10	
8.	PC	UCEPC0432	Environmental Chemistry and Microbiology Laboratory	-	-	2	2	1	ISE ESE (POE)	25 25	10 10	
9.	OJT (MPBL)	UCEIL0471	Mini Project - I	-	-	2	2	1	ISE	25	10	
10.	VSEC	UCEVS0433	Geospatial Laboratory	-	-	2	2	1	ISE	25	10	
11.	CC	UCECC0434	Co-Curricular Activities I	-	-	2	2	1	ISE	50	20	
12.	MM	*UCEMM0__	Multi-Disciplinary Minor	3	-	-	3	3	ESE	100	40	
						Total:	**28**	**23**	**Total Marks: 850** **Total Credit: 23**			

*UCEMM0441	Statistics for Data Science (MM-II)
*UCVMM0441	Instrumentation and Data Analytics (MM-II)
*UCEMM0442	Introduction to Human Resource management (MM-II)

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SEMESTER-V

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component			
1.	PC	UCEPC0501	Water Supply Engineering	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2.	PC	UCEPC0502	Transportation Engineering	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3.	PC	UCEPC0503	Air Pollution and Control	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
4.	PEC	UCEPE05**	Program Elective – I	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
5.	OE	UCEOE05**	Open Elective – I	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
6.	HSSM	UCEEM0504	Sustainability Management	2	-	-	2	2	ESE	50	20	
7.	PC	UCEPC0531	Water Treatment Laboratory	-	-	2	2	1	ISE ESE (POE)	25 25	10 10	
8.	PC	UCEPC0532	Transportation Engineering Laboratory	-	-	2	2	1	ISE	25	10	
9.	VSEC	UCEVS0533	Environmental Monitoring Laboratory	-	-	2	2	1	ISE ESE (OE)	25 25	10 10	
10.	CEP	UCEIL0571	Mini Project – II	-	-	2	2	1	ISE	25	10	
11.	MM	*UCEMM0__	Multi-Disciplinary Minor	3	-	-	3	3	ESE	100	40	
						Total:	**27**	**23**	**Total Marks: 800** **Total Credit: 23**			

*UCEMM0541	Python for Data Science (MM-III)
*UCVMM0541	Applications of AI (MM-III)
*UCEMM0542	Introduction to Marketing Management (MM-III)

Program Electives:

PROGRAM ELECTIVE –I (PEC)								
Sr. No.	**Semester**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1.	V	UCEPE0511	Environmental Sanitation (PE-I)	3	-	-	3	3
2.	V	UCEPE0512	Renewable Energy Engineering (PE-I)	3	-	-	3	3
3.	V	UCEPE0513	Construction Practices (PE-I)	3	-	-	3	3
						Total:	**3**	**3**

Open Elective Courses:

OPEN ELECTIVE –I (OE)								
Sr. No.	**Semester**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1.	V	UCEOE0521	Water Resources Management	3	-	-	3	3
						Total:	**3**	**3**

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SEMESTER-VI

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component			
1.	PC	UCEPC0601	Wastewater Engineering	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2.	PC	UCEPC0602	Solid Waste Management	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3.	PC	UCEPC0603	Geotechnical Engineering	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
4.	PEC	UCEPE06**	Program Elective – II	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
5.	OE	UCEOE06**	Open Elective – II	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
6.	AEC	UCEAE0604	Business Communication and Value Science		-	2	2	1	ISE	50	20	
7.	PC	UCEPC0631	Wastewater Engineering Laboratory	-	-	2	2	1	ISE ESE (OE)	25 25	10 10	
8.	PC	UCEPC0632	Geotechnical Engineering Laboratory	-	-	2	2	1	ISE ESE (POE)	25 25	10 10	
9.	PC	UCEPC0633	Programming Laboratory	-	-	2	2	1	ISE	25	10	
10.	FP	UCEIL0671	Design and Drawing of Environmental Systems	-	-	2	2	1	ISE	25	10	
11.	CC	UCECC0634	Co-Curricular Activities II	-	-	2	2	1	ISE	50	20	
12.	MM	*UCEMM0__	Multi-Disciplinary Minor	3	-	-	3	3	ESE	100	40	
						Total:	**29**	**23**	**Total Marks: 850** **Total Credit: 23**			

*UCEMM0641	Data Analytics (MM-IV)
*UCVMM0641	Digital Twin and Asset management (MM-IV)
*UCEMM0642	HR practices in the Organization (MM-IV)

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PROGRAM ELECTIVE – II (PEC)

Sr. No.	Semester	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	VI	UCEPE0611	Noise Pollution and Control (PE-II)	3	1	-	4	4
2.	VI	UCEPE0612	Irrigation and Hydraulic Structures (PE-II)	3	1	-	4	4
3.	VI	UCEPE0613	Design of Steel Structures (PE-II)	3	1	-	4	4
						Total:	**4**	**4**

OPEN ELECTIVE –II (OE)

Sr. No.	Semester	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	VI	UCEOE0621	Waste Management	3	-	-	3	3
2.	VI	UCEOE0622	Industrial Health & Safety	3	-	-	3	3
						Total:	**3**	**3**

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SEMESTER-VII

Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component			
1.	PC	UCEPC0701	Design of Concrete Structures	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2.	PC	UCEPC0702	Advanced Water and Wastewater Treatment	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3.	PC	UCEPC0703	Quantity Surveying and Valuation	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
4.	PEC	UCEPE07**	Program Elective – III	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
5.	OE	UCEOE07**	Open Elective – III	2	-	-	2	2	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
6.	PC	UCEPC0731	Treatability Studies Laboratory	-	-	2	2	1	ISE ESE (OE)	25 25	10 10	
7.	PC	UCEPC0732	Quantity Surveying and Valuation Laboratory	-	-	2	2	1	ISE ESE (POE)	25 25	10 10	
8.	RM (Project)	UCEIL0771	Project I	-	-	8	8	4	ISE ESE	50 50	20 20	
9.	MM	*UCEMM0__	Multi-Disciplinary Minor	3	-	-	3	3	ESE	100	40	
						Total:	**29**	**23**	**Total Marks: 800** **Total Credit: 23**			

*UCEMM0741	Mathematical Modelling and Simulation (MM-V)
*UCVMM0741	Automation in Project Implementation (MM-V)
*UCEMM0742	Introduction to Financial Management (MM-V)

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PROGRAM ELECTIVE –III (PEC)								
Sr. No.	**Semester**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1.	VII	UCEPE0711	Environment, Health, and Safety (PE-III)	3	-	-	3	3
2.	VII	UCEPE0712	Operation and Maintenance of Environmental Facilities (PE-III)	3	-	-	3	3
3.	VII	UCEPE0713	Transportation Infrastructure (PE-III)	3	-	-	3	3
						Total:	**3**	**3**

OPEN ELECTIVE-III(OE)								
Sr. No.	**Semester**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1.	VII	UCEOE0721	Environmental Policies & Laws	2	-	-	2	2
2.	VII	UCEOE0722	Environmental Impact Assessment	2	-	-	2	2
						Total:	**2**	**2**

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SEMESTER-VIII

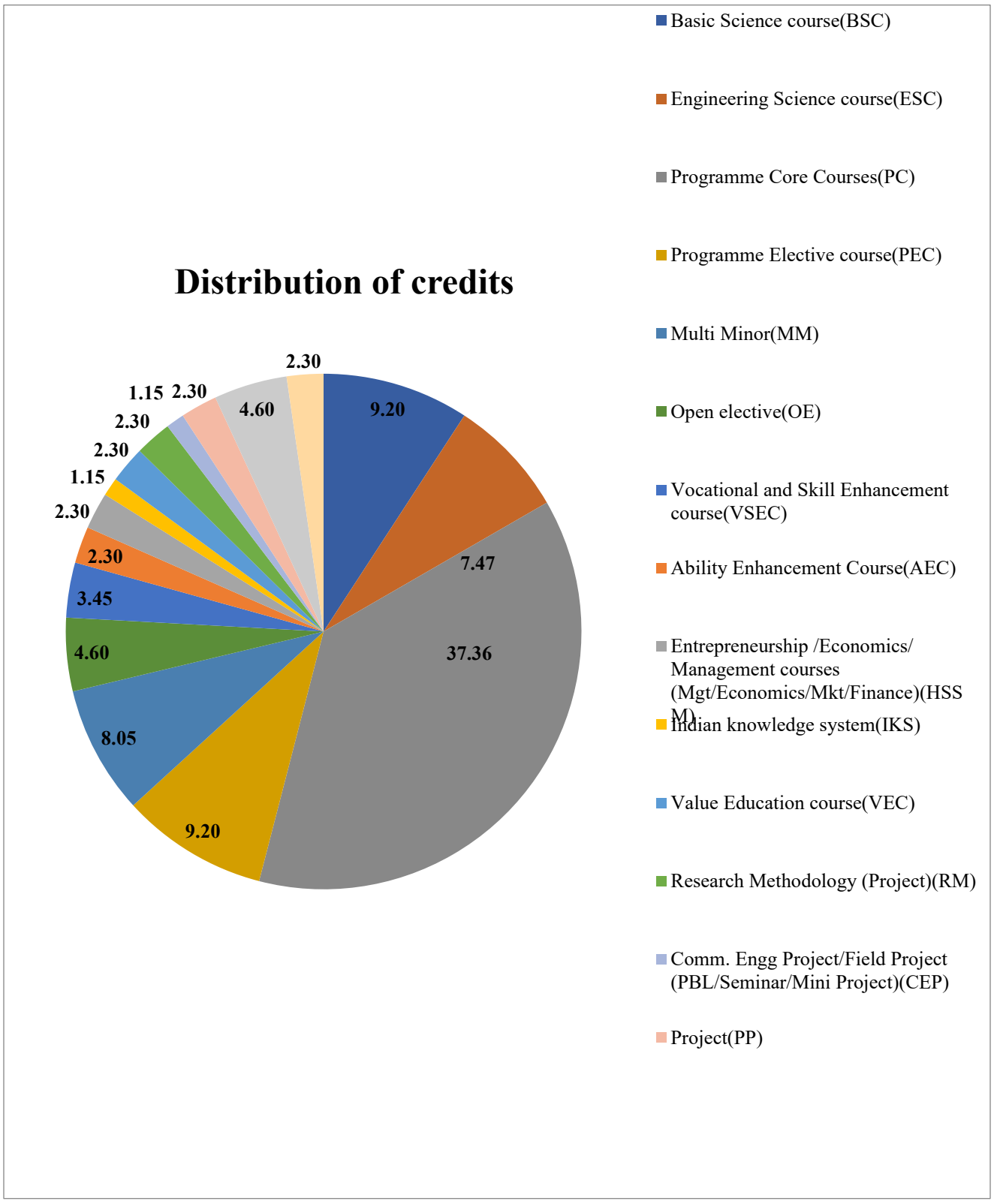
Sr. No.	Category	Course Code	Course Name	L	T	P	Hrs. / Week	Credits	Evaluation Scheme			
									Component			
1.	PEC	UCEPE08**	Program Elective – IV	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
2.	PEC	UCEPE08**	Program Elective – V	3	-	-	3	3	ISE1 MSE ISE2 ESE	10 30 10 50	 20	40
3.	PP	UCEIL0871	Project II	-	-	8	8	4	ISE ESE	50 50	20 20	40
4.	OJT	UCEIL0872	Internship	-	-	12	12	6	ISE I ISE II	75 75	30 30	60
5.	CC	UCECC0831	Co-Curricular Activities	-	-	2	2	1	ISE	50	20	
						Total:	**28**	**17**	**Total Marks: 500 Total Credit: 17**			

PROGRAM ELECTIVE – IV(PEC)

Sr. No.	Semester	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	VIII	UCEPE0811	Advanced Construction Technology (PE-IV)	3	-	-	3	3
2.	VIII	UCEPE0812	Industrial Wastewater Treatment (PE-IV)	3	-	-	3	3
3.	VIII	UCEPE0813	Urban and Rural Planning (PE-IV)	3	-	-	3	3
4.	VIII	UCEPE0814	Environmental Impact Assessment & Legislation (PE-IV)	3	-	-	3	3
						Total:	**3**	**3**

PROGRAM ELECTIVE –V (PEC)

Sr. No.	Semester	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	VIII	UCEPE0815	Environmental Management System (PE-V)	3	-	-	3	3
2.	VIII	UCEPE0816	Project Management (PE-IV)	3	-	-	3	3
3.	VIII	UCEPE0817	Environmental Social Governance (PE-V)	3	-	-	3	3
4.	VIII	UCEPE0818	Hazardous Waste Management (PE-V)	3	-	-	3	3
						Total:	**3**	**3**



Pie chart showing the distribution of credits.

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

MULTIDISCIPLINARY MINOR IN DATA SCIENCE (MDM-DS)								
Sr. No.	**Seme**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1.	III	UCEMM0341	Introduction to Data Science (MM-I)	2	-	-	2	2
2.	IV	UCEMM0441	Statistics for Data Science (MM-II)	3	-	-	3	3
3.	V	UCEMM0541	Python for Data Science (MM-III)	3	-	-	3	3
4.	VI	UCEMM0641	Data Analytics (MM-VI)	3	-	-	3	3
5.	VII	UCEMM0741	Mathematical Modeling & Simulation (MM-V)	3	-	-	3	3
						Total:	**14**	**14**

MULTIDISCIPLINARY MINOR in PROJECT AUTOMATION (MDM-PE)								
Sr. No.	**Sem**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1.	III	UCVMM0341	Basics of Projects and Automation (MM-I)	2	-	-	2	2
2.	IV	UCVMM0441	Instrumentation and Data Analytics (MM-II)	3	-	-	3	3
3.	V	UCVMM0541	Applications of AI (MM-III)	3	-	-	3	3
4.	VI	UCVMM0641	Digital Twin and Asset Management (MM-IV)	3	-	-	3	3
5.	VII	UCVMM0741	Automation in Project Implementation (MM-V)	3	-	-	3	3
						Total:	**14**	**14**

MULTIDISCIPLINARY MINOR In LEADERSHIP and MANAGEMENT (MDM-HRD)								
Sr. No.	**Seme**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Hrs. / Week**	**Credits**
1.	III	UCEMM0342	Introduction to Management (MM-I)	2	-	-	2	2
2.	IV	UCEMM0442	Introduction to Human Resource Management (MM-II)	3	-	-	3	3
3.	V	UCEMM0542	Introduction to Marketing Management (MM-III)	3	-	-	3	3
4.	VI	UCEMM0642	HR Practices in the Organization (MM-IV)	3	-	-	3	3
5.	VII	UCEMM0742	Introduction to Financial Management (MM-V)	3	-	-	3	3
						Total:	**14**	**14**

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

B. TECH (HONS.) IN CIVIL AND ENVIRONMENTAL ENGINEERING WITH SPECIALIZATION IN GREEN TECHNOLOGY AND SUSTAINABILITY ENGINEERING

Sr. No.	Semester	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	III	UCEHC0351	Environmentally Sustainable Materials	3	1	-	4	4
2.	IV	UCEHC0451	Energy Technologies and Management	3	1	-	4	4
3.	V	UCEHC0551	Faecal Sludge and Septage Management	3	1	-	4	4
4.	VI	UCEHC0651	Environmental Economics	3	1	-	4	4
5.	VII	UCEHC0751	Mini Project	-	-	4	4	2
						Total:	**20**	**18**

B. TECH (EMERGING MINOR) IN CIVIL AND ENVIRONMENTAL ENGINEERING WITH SPECIALIZATION IN SUSTAINABILITY ENGINEERING

Sr. No.	Semester	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	III	UCEMNC0361	Sustainable Materials	3	1	-	4	4
2.	IV	UCEMNC0461	Clean Energy Engineering	3	1	-	4	4
3.	V	UCEMNC0561	Climate Change and Sustainable Development	3	1	-	4	4
4.	VI	UCEMNC0661	Sustainable Infrastructure Engineering	3	1	-	4	4
5.	VII	UCEMNC0761	Environmental Management	2	-	-	2	2
						Total:	**18**	**18**

B. TECH (EXIT COURSES) IN CIVIL AND ENVIRONMENTAL ENGINEERING After semester IV

Sr. No.	Semester	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	After IV	UCEEX0491	Advance Construction Technology	3	-	-	3	3
2.	After IV	UCEEX0492	Civil Drafting	1	-	4	5	3
3.	After IV	UCEEX0493	Construction Site Supervision Training	-	-	4	4	2
						Total:		**08**

B. TECH (EXIT COURSES) IN CIVIL AND ENVIRONMENTAL ENGINEERING After semester VI

Sr. No.	Semester	Course Code	Course Name	L	T	P	Hrs. / Week	Credits
1.	After VI	UCEEX0691	Estimation & Costing	3	-	-	3	3
2.	After VI	UCEEX0692	Occupational Health & Safety	3	-		3	3
3.	After VI	UCEEX0693	Training	-	-	4	4	2
						Total:		**08**

Semester 7

Class: Final Year B. Tech Civil and Environmental Engineering **Title of the Course:** Design of Concrete Structures **Course Code:** UCEPC0701	**L**	**T**	**P**	**Credits**
	3	**-**	**-**	**3**

Course Pre-Requisite:

Students shall have knowledge of:

- Algebra and Engineering Mathematics
- Engineering Mechanics
- Structural Mechanics
- Concrete Technology

Course Description:

The course imparts fundamental knowledge on concepts of structural reinforced concrete and its design philosophies. An Environmental Engineer needs to understand the structural design of treatment units, design of various structural members such as beams, slabs, columns of buildings, units of treatment plants, storage tanks GSR and ESR. Water distribution systems, Sewerage Systems as well as apply checks for safety and serviceability. Knowledge of RCC sections is necessary in estimating and costing of projects also.

Course Objectives:

1. To study concepts and design philosophies of Reinforced Cement Concrete
2. To understand analysis and design of reinforced concrete sections
3. To know various checks for the designs.
4. To learn designs of specific RCC elements/structures.

Course Learning Outcomes:

CO	**After the completion of the course the students will be able to**	**Bloom's Taxonomy** **Cognitive Domain**
CO1	Explain design philosophies and stress-strain behavior of Reinforced Cement Concrete sections.	Understanding L2
CO2	Apply concepts of analysis and design of various RCC section.	Applying L3
CO3	Interpret the design with respect to safety and stability checks of structural parts.	Evaluate L5
CO4	Design specific structural elements /components of Reinforced Cement Concrete structures.	Creating L6

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	1	-	-	-	-	-	-	-	-
CO2	1	3	3	-	-	-	-	-	-	-	-
CO3	-	2	2	-	-	-	-	-	2	-	-
CO4	-	2	3	-	-	2	-	-	2	2	2

CO	**PSO1**	**PSO2**
CO1	-	-
CO2	-	2
CO3	-	2
CO4	-	2

Assessments:

Assessment	**Weightage (Marks)**
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE 1 and ISE 2** are based on assignment/declared test/quiz/seminar/Group Discussions etc.
- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 60-70% weightage for course

content (normally last three Units) covered after MSE.	
Course Contents:	
Unit : 1: Introduction- Stress strain behavior of concrete and steel, Behavior of RCC, Permissible stresses in steel and concrete, Design philosophies, Various limits states, Characteristics strength and Characteristic load, Load factor, Partial safety factors. Analyze forces in structure	**6 Hrs.**
Unit 2: Limit state of collapse (flexure): Analysis and Design of Singly and Doubly Reinforced rectangular sections, Singly reinforced Flanged beams.	**8 Hrs.**
Unit 3: Limit state of collapse (shear and bond): Shear failure, Types of Shear reinforcement, Design of Shear reinforcement, Bond-types, Factors affecting bond Resistance, Check for development length. Limit state of serviceability: Significance of deflection, IS recommendations, Cracking-classification and Types of Cracks, Causes, mechanism and IS recommendations.	**8 Hrs.**
Unit 4: Design of slabs: One way, Two way with different support conditions as per IS:456, Cantilever slabs. Design of staircases: Design of Simply Supported and Dog legged staircases	**8 Hrs.**
Unit 5: Analysis and Design of axially and eccentrically (uni-axial) loaded circular, rectangular columns, Interaction diagram, Circular column with helical reinforcement, Design of footings	**7 Hrs.**
Unit 6: Design of water tank: design criteria , permissible stresses, design of circular water tank resting on ground with flexible and rigid base, design of rectangular water tank resting on ground by approximate method, Design of ESR	**8 Hrs.**
Textbooks / Reference books: 1 IS 456-2000 2. Limit state theory and Design –Karve and Shah, Structures publications, Pune 3. Reinforced Concrete Design – Limit state - A.K. Jain Nem Chand brothers Roorkee 4. Fundamentals of Reinforced Concrete –Sinha and Roy, S. Chand and company Ltd. Ram Nagar, New Delhi 6. Limit State Design of reinforced concrete P.C.Varghese, Prentice Hall, New Delhi 7. Reinforced Concrete Design- B.C. PunmiaLaxmi publications New Delhi 8. Reinforced Concrete Design-M. L. Gambhir-Mcmillan India Ltd. New Delhi 9. Special publications -16-Bureau of Indian standard	

Class: Final B. Tech Environmental Engineering **Title of the Course:** Advanced Water and Wastewater Treatment **Course No.:** UCEPC0702	**L**	**T**	**P**	**Credit**
	03 hours per week	-	-	3

Course Pre-Requisite:
Environmental Chemistry and Microbiology (UCEPC0405)
Water Supply Engineering (UCEPC0501)
Wastewater Engineering (UCEPC0601)

Course Description:
This course explores cutting-edge technologies and integrated management strategies for modern water challenges. It emphasizes moving beyond simple pollutant removal toward resource recovery, climate resilience, and smart automation.

Course Learning Objectives:
1. To introduce students to emerging contaminants in water and wastewater and the principles and applications of advanced physicochemical treatment technologies
2. To provide in-depth understanding of biological and chemical processes for nutrient removal and recovery
3. To familiarize students with sustainable and energy-positive approaches in wastewater management
4. To equip students with knowledge of economic evaluation, automation technologies, and policy frameworks

Course Outcomes:

COs	**After the completion of the course, the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Apply principles of reaction kinetics and reactor hydraulics to determine design parameters for water resource recovery facilities.	Cognitive (Apply) L3
CO.2	Analyze the performance of advanced filtration and membrane processes to identify fouling patterns and select appropriate control measures.	Cognitive (Analyze) L4
CO.3	Evaluate natural treatment systems based on removal mechanisms and selection criteria for sustainable decentralized wastewater management.	Cognitive (Evaluate) L5
CO.4	Design physico-chemical and biological systems for the removal of nutrients and emerging contaminants to meet environmental discharge standards.	Cognitive (Create) L6

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO.1	3	3	2	2	1	-	1	-	-	-	-
CO.2	3	3	2	2	2	1	2	-	-	-	-
CO.3	2	2	3	1	-	2	3	-	-	-	1
CO.4	3	3	3	2	1	2	3	-	-	-	-

COs	**PSO1**	**PSO2**
CO.1	2	3
CO.2	2	3
CO.3	3	2
CO.4	3	2

Assessments :

Assessment	**Weightage (Marks)**
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).

- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Fundamentals of Advanced Treatment & Process Kinetics Context: Review of conventional treatment paradigms; drivers for advanced treatment; principles of wastewater reclamation, recycling, and reuse. The WRRF Model: Evolution from traditional plants to Water Resource Recovery Facilities (WRRF). Reaction Engineering: Analysis of reaction types and kinetics; classification of reactors (Batch, CSTR, PFR); fundamental principles of reactor design. Biological Modeling: Microbial growth kinetics; mathematical modeling of suspended-growth vs. attached-growth (biofilm) systems.	**08 Hrs.**
Unit 2: Advanced Filtration & Membrane Technology Depth Filtration: Design, operation, and performance of Dual Media Filters; mathematical modeling of head loss and filtration efficiency. Membrane Processes: Classification (MF, UF, NF, RO) and terminology; membrane configurations and modules. Operational Challenges: Mechanisms of membrane fouling, scaling, and concentration polarization; strategies for flux enhancement and fouling control. Specialized Systems: Applications of membrane technology in water reuse; principles of Electrodialysis.	**08 Hrs.**
Unit 3: Mass Transfer (Adsorption and Ion Exchange) Adsorption: Physical vs. chemical adsorption; development of adsorption isotherms (Langmuir, Freundlich); kinetics of activated carbon adsorption. System Design: Breakthrough curve analysis; design and scaling of Fixed-Bed Adsorption Columns. Ion Exchange: Chemistry of ion exchange; types of resins and exchange capacity; design of ion exchange units. Residuals Management: Management and disposal of concentrate/brine waste streams.	**08 Hrs.**
Unit 4: Biological & Physico-Chemical Nutrient Recovery Nitrogen Dynamics: Nitrogen species in wastewater; biochemistry of biological nitrification and denitrification (suspended and attached growth). Phosphorus Removal: Enhanced Biological Phosphorus Removal (EBPR) mechanisms; process configurations (A2O, PhoStrip, etc.). Nutrient Recovery: Physico-chemical techniques for the removal and resource recovery of N and P (e.g., struvite precipitation).	**07 Hrs.**
Unit 5: Emerging Contaminants & Advanced Disinfection Advanced Removal: Specialized treatment for heavy metals, dissolved inorganic solids, and refractory (non-biodegradable) organics. Emerging Pollutants: Occurrence and fate of microplastics, Pharmaceuticals and Personal Care Products (PPCPs), industrial endocrine disruptors, and PFAS. Advanced Oxidation Processes (AOPs): Mechanism and design of UV-based disinfection, Ozonation, and hydroxyl radical-based oxidation.	**07 Hrs.**
Unit 6: Natural & Decentralized Treatment Systems Constructed Wetlands (CW): Classification and hydraulics; Free Water Surface (FWS), Subsurface Flow (SSF), and Vertical Flow (VF) wetlands. System Design: Selection of macrophytes and media; pollutant removal mechanisms (sedimentation, microbial degradation, plant uptake). Implementation: Engineering design procedures, application in decentralized settings, and long-term O&M (Operations & Maintenance) of aquatic treatment systems.	**07 Hrs.**

Textbooks:

1. Wastewater Engineering Treatment and Resource Recovery – Metcalf & Eddy, Inc., George Tchobanoglous, Franklin Burton, H. David Stensel, Tata McGraw-Hill Education.
2. Wastewater Treatment for Pollution Control – Soli J. Arceivala and Shyam R. Asolekar, Tata McGraw-Hill Education.

3. Environmental Engineering- Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, McGraw-Hill Education.

References:

1. Theory and Practice of Water and Wastewater Treatment – Ronald Droste, John Wiley, 2019
2. Manual- Constructed Wetlands Treatment of Municipal Wastewaters- USEPA, 2000
3. Manual on Constructed Wetland as an alternative technology for sewage management in India- CPCB, MoEFCC, Government of India
4. Physicochemical processes: for water quality control – W. J. Weber, Wiley Interscience, 1972
5. Wastewater-Reuse-Certificates-as-Tradeable-Permits-A-Handbook-for-Roll-Out, World Bank Group

Class: B. Tech Civil and Environmental Engineering **Title of the Course:** Quantity Surveying andValuation **Course No.:** UCEPC0703	**L**	**T**	**P**	**Credits**
	03 hours per week	---	---	03

Course Pre-Requisite:

Students must have knowledge about numerical and mathematical applications in solving problems of areaand volume measurements. Also, students must have knowledge of mode of measurement for variousbuilding components.

Course Description:

The objective of the course is imparting fundamental knowledge in the following concern

- Estimation of quantities of various building components
- Calculate quantity of materials and labours for various building components
- Calculate rates of various building items and detailed estimate.
- Do the valuation of different construction projects.

Course Learning Objectives:

At the end of the course students will be able to

1. Estimate quantities of various components of buildings and environmental structures.
2. Do rate analysis for various items in the building.
3. Understand the various concepts in valuation.
4. Calculate market value of building by different methods..

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Select the method for calculating the quantities of building andenvironmental structures.	Cognitive (Apply) L3
CO.2	Explain the various concepts in valuation	Cognitive (Understanding) L2
CO.3	Estimate the materials, labors and rates required for various works.	Cognitive (Evaluating) L5
CO.4	Evaluate various items for valuation of different works as perstandards and specifications.	Cognitive (Evaluating) L5

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO.1	3	2			2						
CO.2	2			1	2					2	
CO.3	3	2	1								
CO.4	1				1					2	2

COs	**PSO1**	**PSO2**
CO.1	-	2
CO.2	-	2
CO.3	-	2
CO.4	-	2

Assessments:

Assessment	**Weightage (Marks)**
ISE-1	10
MSE	30

ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: a) Introduction: General Introduction to Quantity surveying, purpose of estimate types ofestimates, various items to be included in estimate including budget of safety provisions. Mode of measurement of various items,IS1200, Administrative approval and technical sanction to estimates, Prime cost, Provisionalsums and provisional quantities b) Specifications and basic principles of general and detailed specifications,specifications for different items of work for building, water supply and sewerage work	07 Hrs.
Unit: 2 a) Estimation of residential building; Estimate of different items of buildings b) Analysis of Rates: Factors affecting the cost. Materials, Labor, task work schedule as basisof labor cost, rates of various machinery, tools and plants, overhead charges, Rates for variousitems of construction of civil Engineering works, standard schedule of Rates, DSR and use ofDSR for estimating	07 Hrs.
Unit: 3 Approximate Estimates: Purpose, various methods used for building and other Civil Engg. Works water supply, Drainage, irrigation and Road projects. Different methods for executingwork like contract method, Departmental, Organizational set-up of various govt. bodies likePWD, Water Supply Departments and general idea about its working and delegation of power,classification of works, Methods for carrying out work. Measurement books, mode of payment,bill forms, Global contractors, local competitive bidding.	07 Hrs.
Unit :4 a) Contracts: Essentials of legally valid contract. Different types of contracts. Suitability ofdifferent types of contracts. b) Tender Procedure: Various types of tenders, preparing tender papers, invitation of tenders,tender notice, submission, scrutiny and Acceptance of tenders, conditions of contracts, right andresponsibilities of the parties to contract. c) Introduction to Arbitration	08 Hrs.
Unit :5 a) Principles of valuation: Definition of value, unit price and cost attributes of values. Different types of value b) Valuer and his duties, purpose of valuation and its function. Factors affecting the valuationof properties, Tangibles and intangibles, Landed properties, freehold and lease holdproperties. Different type of Lease. c) Various methods of valuation: Rental Method, belting method of Valuation, valuation forwater supply and sewerage schemes	08 Hrs.
Unit :6 a) Depreciation: Different methods of calculating depreciation: declining balance method, sinking fund method, depreciated cost, factors for obsolescence. b) Sinking Fund: Definition, purpose, calculation of sinking fund, sinking fund calculations for various equipment's and machinery used in water supply and sewerage schemes.	08 Hrs.

c) BOT: Concepts of execution of works by the methods like BOT	

Textbooks:

1. Estimating and Costing –B. N.Datta, 24th edition, UBS publishers Pvt Ltd.
2. Estimating, costing and specifications in civil engineering – Chakraborty M., Publications: M. Chakraborty, ISBN-10 818530436X
3. Estimating and Costing –G.S. Birdi, DhanpatRai publishing company.

References:

1. District Schedule of Rates for PWD, MJP
2. Quantity Surveying – P. L. Bhasin
3. Elements of estimating and costing – S. C. Rangawala.
4. Civil Engg. Contracts and Estimates – B. S. Patil
5. Professional Practice – RoshanNamavati (Estimating and Valuation)
6. Bombay P. W. D. volumes I and II 7. Valuation of real properties – S. C. Rangawala.

Class: Final year B. Tech Civil and Environmental Engineering **Title of the Course:** Environment, Health and Safety (PE-III) **Course No.:** UCEPE0711	**L**	**T**	**P**	**Credit**
	03 hours per week	-	-	3

Course Pre-Requisite: Students shall have the knowledge of:

- Engineering Chemistry
- Engineering Mechanics
- Engineering Management
- Concepts of air, water, and solid waste pollution

Course Description:

This course provides comprehensive exposure to Environment, Health and Safety (EHS) principles and practices essential for industrial and infrastructure sectors. It focuses on developing students' understanding of industrial work environments, occupational health and safety hazards, accident causation and prevention, and compliance with statutory safety and environmental legislations. The course integrates concepts of safety engineering, hazard identification and risk assessment, safety management systems, occupational health, industrial hygiene, and emergency preparedness, with emphasis on practical application and industry relevance. Through this course, students will be equipped to recognize, evaluate, and manage environmental and workplace risks, thereby contributing to safer, healthier, and more sustainable industrial operations.

Course Learning Objectives:

1. Understand industrial environment, EHS legislation, and compliance requirements.
2. Analyze causes and impacts of industrial accidents and occupational hazards.
3. Apply safety engineering principles for hazard identification and risk control.
4. Implement EHS management systems for safe and sustainable workplaces.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Explain environmental, health, and safety legislations applicable to industries.	Cognitive(Understanding) L2
CO.2	Explain causes and consequences of industrial accidents and occupational hazards.	Cognitive(Understanding) L2
CO.3	Apply safety engineering principles for hazard identification and risk assessment.	Cognitive (Applying) L3
CO.4	Implement EHS management systems for occupational health, industrial hygiene, and emergency preparedness.	Cognitive (Applying) L3

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	**2**	**1**	**–**	**–**	**–**	**3**	**2**	**–**	**–**	**1**	**–**
CO2	**2**	**3**	**2**	**–**	**–**	**3**	**–**	**–**	**–**	**–**	**–**
CO3	**3**	**2**	**3**	**2**	**2**	**3**	**–**	**–**	**–**	**–**	**–**
CO4	**2**	**2**	**2**	**–**	**1**	**3**	**1**	**1**	**1**	**2**	**2**

COs	**PSO1**	**PSO2**
CO1	2	1
CO2	3	1
CO3	2	2
CO4	2	2

Assessments:

Assessment	**Weightage (Marks)**
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions

etc. (For each ISE two different tools are to be used).

- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Environment, Safety Rules and Legislations Introduction to industrial environment and EHS concepts; overview and provisions of Factories Act, 1948, Environment (Protection) Act, 1986, Employees State Insurance Act, 1948, Child Labour and Women Employees Acts; Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989; Fly Ash Utilization Notification; introduction to Health and Safety Management Systems and ISO 45001:2018.	**07 hours**
Unit 2: Accident Theories, Investigation and Reporting Concept of accidents, types, causes, and consequences; accident statistics; unsafe acts and unsafe conditions; direct and indirect costs of accidents; principles and activities of accident prevention; accident investigation and reporting—objectives, investigator qualifications, investigation strategy, documentation, and report preparation; theories of accident causation including Heinrich's Domino Theory, Human Factors Theory, Systems Theory, and Combination Theory.	**07 hours**
Unit 3: Safety Management and Training Safety and health management—need, objectives, and principles; theories of safety and Three E's (Engineering, Education, Enforcement); safety audits and review techniques; checklist analysis, What-If analysis, and safety warning systems; safety in construction activities; safety training—identification of training needs, training methods, evaluation, feedback, motivation, and organizational relationships.	**08 hours**
Unit 4: Hazard Management and Plant Layout Hazard management process; hazard identification and workplace inspection; risk assessment and risk control techniques; risk assessment tools and Risk Priority Number (RPN); HAZOP, fire hazards and fire safety; machine guarding techniques and types of guards; housekeeping and 5-S concept; plant and machine layout for safety—objectives, site selection, layout types; Lockout–Tagout (LOTO) system; personal protective equipment—types, selection, and usage.	**07 hours**
Unit 5: Environment, Health and Safety Management Systems Fundamentals of EHS Management Systems; importance and key elements; EHS policy, planning, implementation, monitoring, and review; internal audits and management reviews; performance measurement at individual and organizational levels; benefits and practical aspects of EHS implementation in industries.	**07 hours**
Unit 6: Occupational Health and Industrial Hygiene Objectives and scope of occupational health and industrial hygiene; acute and chronic health effects; exposure limits and indices—LD_{50}, LC_{50}, TLV, TWA, STEL; physical, chemical, biological, and ergonomic hazards; worker protection measures; personal and workplace monitoring systems; safety requirements for confined space entry, underground work, working at height, and hot/cold work permits; on-site and off-site emergency management plans; introduction to OHSAS 18001; chemical hazards and controls; storage and transportation of hazardous chemicals; Material Safety Data Sheets (MSDS); inspection, testing, and maintenance.	**08 hours**

Textbooks:

1. Occupational Safety and health -by David L. Goetsch, Prentice Hall, Ohio
2. Handbook of Environmental Health and Safety: Herman Koren and Michel Bisesi, Jaico Publishing House, Delhi (1999)
3. Handbook of Environmental Risk Assessment and Management: Peter Calow, Blackwell Science Ltd. USA (1998)
4. Introduction to Industrial Safety - by K.T. Kulkarni

ReferenceBooks

1. Environmental Health& SafetyAuditingHandbook-byLeeHarrison,MacGrawHillInc.
2. HealthHazardsoftheHumanEnvironment -WorldHealthOrganization,Geneva,1972
3. IndustrialandOccupational Safety,Health &Hygiene-byDr.A.H.Hommadi.
4. SloteL. Handbook of Occupational SafetyandHealth,JohnWilleyandSons,NewYork
5. GrimaldiandSimonds, SafetyManagement,AITBSPublishers,NewDelhi(2001)
6. IndustrialSafetyandpollutioncontrol handbook: NationalSafetyCouncilandAssociatepublishersPvt.Ltd, Hyderabad

Class: Final Year B. Tech Civil and Environmental Engg. **Title of the Course:** Operation and Maintenance of Environmental Facilities **Course Code:** UCEPE0712	**L**	**T**	**P**	**Credit**
	3	**-**	**-**	**3**

Course Pre-Requisite:

- Students shall have knowledge of Water Supply Engineering.
- Students shall have knowledge of Wastewater Engineering.
- Students shall have knowledge of Air Pollution and Control.

Course Description:

Operation and Maintenance of Environmental Facilities deals with the operation of environmental facilities like water supply facilities, water treatment plants, water distribution systems, wastewater treatment plants, wastewater collection systems, air pollution control equipment and their maintenance.

Course Learning Objectives:

At the end of course students will

1. Know the necessity of maintenance of environmental facilities.
2. Study measures to avoid failures in pipe systems.
3. Understand the criteria of operation and its purpose for water treatment plants, wastewater treatment plants and air pollution control equipments.
4. Learn the importance of planning and scheduling in maintenance activities.

Course Outcomes:

CO	**After completion of course students will be able to**	**Blooms Cognitive Descriptor**
CO1	Explain the types of maintenance, use of diagrams and manuals in operation and maintenance activities.	Cognitive (Understanding) L2
CO2	Summarize the necessity of planning and scheduling in operation and maintenance activities.	Cognitive (Understanding) L2
CO3	Interpret the operation and maintenance requirements of air pollution control equipments.	Cognitive (Understanding) L2
CO4	Identify the appropriate remedies for problems in transmission pipes, water treatment plants and wastewater treatment plants.	Cognitive (Applying) L3

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1								**2**		**2**	
CO2		**2**						**2**		**2**	
CO3		**2**						**2**		**2**	
CO4		**2**						**2**		**2**	

COs	**PSO1**	**PSO2**
CO1		
CO2		
CO3		
CO4		

Assessments:

Assessment	**Weightage (Marks)**
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/ Declared Test/ Quiz/ Seminar/ Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Introduction Need of O and M, Types of Maintenance – Corrective and Preventive, Data: Detailed Plans, Drawings, Operation Manuals, Log Books, Computer Usage in O and M.	**05 Hrs.**
Unit 2: Water Intakes and WTP O and M of Water Supply Facilities: Intakes, Pumps, Transmission Pipes, Water Treatment Plant Units Maintenance, Quantity and Quality Monitoring.	**09 Hrs.**
Unit 3:Water Distribution Systems Water Distribution System: Maintenance of Water Distribution System; Reservoirs, Loss of Carrying Capacity of Pipes, Pipe Breaks and Leakages, O and M of Appurtenances-Pipe Joints, Water Meters, Water Audit, Use of sensors, PLCs in operation.	**09 Hrs.**
Unit 4: Wastewater Facilities O and M of Wastewater Facilities: Sewerage System and Appurtenances, Inspection Methods, Cleaning and Rehabilitation, Safety in Sewer Inspection, O and M of Wastewater Treatment Plant - Activated Sludge Process, Trickling Filters, Monitoring and Operational Problems, Corrective Measures, Treatment Plant Performance Monitoring.	**09 Hrs.**
Unit 5: Air Pollution Control Facilities Air Pollution Control Facilities: Regular Inspection of Devices, Operation and Maintenance of Particulate Matter Control Equipments, Gravity Settlers, Cyclone Separators, Bag Filters, Scrubbers, Electrostatic Precipitator.	**09 Hrs.**
Unit 6: O and M Planning O and M planning: Organizational Structure, Work Planning, Preparation and Scheduling, Inventory, Cost Estimates, Wastewater Treatment Plant Staff Training	**05 Hrs.**

Textbooks:

1. CPHEEO manual on Water Supply and Treatment
2. CPHEEO manual on Sewerage and Sewage Treatment
3. A manual on Operation and Maintenance of Water Supply Systems by CPHEEO
4. Air Pollution M N Rao, H V N Rao

References:

1. Industrial Air Pollution Control Systems – Neumann
2. O and M of Water treatment plant – Charles R Cox
3. Guidelines for Operation and Maintenance of Effluent Treatment Plants by MPCB

Class: Final Year B. Tech Environmental Engineering **Title of the Course:** Transportation Infrastructure **Course No.:** UCEPE0713	**L**	**T**	**P**	**Credit**
	03 hours per week	-	-	3

Course Pre-Requisite:

- Basic Civil engineering
- Highway & Traffic Engineering
- Surveying

Course Description:

This course will help the students to understand importance of transportation infrastructure. Also they will understand the various agencies involved in planning transportation infrastructure. In this course students will learn about various modes of transportation like road transport, water transport and air transport and infrastructure required for various modes of transportation.

Course Learning Objectives:

1. To introduce various modes of transportation and infrastructure required for transportation.
2. To understand importance of transportation infrastructure & its role in development of nation.
3. To provide an insight on railway engineering, its components & its infrastructure requirements.
4. To learn about components and importance of docks, harbors, terminals, runway etc.

Course Outcomes:

CO's	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Explain the policy framework, development plans, and the role of national agencies in shaping India's infrastructure and society.	Cognitive (Understanding) L2
CO.2	Apply geometric design principles for permanent way components, points, crossings, and signaling systems to ensure safe rail operations.	Cognitive (Applying) L3
CO.3	Plan layout of airport, runways, and terminals buildings.	Cognitive (Applying) L3
CO.4	Analyze the selection criteria for tunnel shapes, harbor sites, and breakwater types based on functional and environmental requirements.	Cognitive (Analyze) L4

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO.1	-	-	-	-	-	1	-	-	-	-	1
CO.2	-	1	-	1	-	-	-	-	-	-	-
CO.3	1	1	-	1	-	-	-	-	-	-	-
CO.4	-	-	-	-	-	-	1	-	-	1	1

COs	**PSO1**	**PSO2**
CO.1	-	-
CO.2	-	-
CO.3	-	1
CO.4	-	1

Assessments:

Assessment	**Weightage (Marks)**
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).

- **MSE:** Assessment is based on 50% of course content (Normally first three Units)

ESE: Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

UNIT 1: Transportation Infrastructure Engineering Infrastructure &its role in developing society; Transport sector in India – policy framework; Development plans.	**07 Hrs.**
UNIT 2: Railway Engineering-I a) Introduction, Permanent Way: Components, coning of wheels b) Points & Crossing: Terms used, standard points and crossings, design of simple turnout various types of track junctions. c) Stations and yards: purpose, location, site selection, types and general layouts of terminus, Junction.	**07 Hrs.**
UNIT 3: Railway Engineering- II a) Signaling and interlocking—Introduction, Construction and maintenance of railway track: methods, material required per KM of track, tools and plant used for plate laying, maintenance of Track,Safety in railways. b) Modern trends in Railway.	**08 Hrs.**
UNIT 4: Tunnels, Dock & Harbors A) Tunneling, Functions of tunnel, criteria for selection of size & shape of tunnels. Pilot tunnel,shaft. B) Requirements of harbors and ports. Classification of harbors with examples Selection of site for harbor, Various components of ports C) Break waters types, comparison, design criteria, methods of construction. wet & dry dock floating dock wharves, jetties, types of fenders dolphins	**07 Hrs.**
UNIT 5: Airport Engineering-I A) Introduction, terminology, components of Aircraft, aircraft characteristics. B) Airport planning: airport surveys, site selection, obstructions.	**07 Hrs.**
UNIT 6: Airport Engineering-II A) Runways: orientation, wind rose, basic runway length, geometric design, airport capacity, runway patterns. Taxiways, terminal buildings**.** B) Introduction to green airport, Its necessity, Case studies.	**08 Hrs.**

Textbooks:

1. Urban Pattern by Gallion, Eisner
2. Rural development Planning – Design and method: Misra S.N., Satvahan Publications New Delhi
3. Construction Planning Methods &Equipment:Puerifoy –Tata MC Graw Hill
4. Construction Equipments& its Management: S.C Sharma,Khanna Publication
5. Dock & Harbour Engineering:HasmukhP.Oza& Gautam H.Oza-Charoter Book Stall
6. BPR (1970): Urban Transportation Planning: General Information and Introduction to System 360. Bureau of Public Roads, Washington D.C.

References:

1. Railway Engineering – K. F. Antia 14 A Course in Railway Engineering - Saxena and Arora, Dhanpatrai& Sons, New Delhi.
2. Railway Engineering, 2/E by Chandra—Oxford University Press
3. Railway Track Engineering: J.S.Mundrey,Tata McGraw Hill
4. Dock & Harbour Engineering:Hasmukh P.Oza& Gautam H.Oza-Charoter Book Stall
5. Construction Project Scheduling & Control, 2ed—Mubarak--Wiley

Class: Final Year B. Tech **Title of the Course:** Environmental Policies and Laws (OE- III) **Course No.:** UILOE0729	**L**	**T**	**P**	**Credit**
	02 hours per week	-	-	2

Course Pre-Requisite:

Students shall have the knowledge of:

- Environmental Studies

Course Description:

Laws and policies play a major role in the conservation and management of natural resources as well as pollution control. This course intends to introduce the students to the vast field of Environmental Law and Policy. Students will learn various environmental legislation of Government of India, Importance of environmental organizations & their functions, Environmental ethics & its importance, role of NGO's. At the end of the course it is expected that the students would be familiar with the overall Environmental Law and Policy regime of the country as well as its international obligations. It is expected that the case studies would equip them with basic knowledge and skills to understand environmental laws.

Course Learning Objectives:

1. To explain scope & need of Environment Legislation.
2. To discuss historical prospective & International environmental legislation & conventions.
3. To teach various Acts in India related to Environment.
4. To elaborate risk associated and importance of economics for environmental components.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Explain and interpret the need, scope, and constitutional basis of environmental legislation.	Cognitive (Understanding) L2
CO.2	Analyze the historical evolution of environmental legislation in India with reference to policy frameworks and judicial interventions	Cognitive (Understanding) L2
CO.3	Apply and evaluate environmental laws and regulations to practical environmental problems.	Cognitive (Applying) L3
CO.4	Examine the international environmental legislation & conventions.	Cognitive (Analyzing) L4

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO.1	0	1	2	0	0	1	0	0	1	0	0
CO.2	0	0	0	0	0	3	0	0	0	0	0
CO.3	2	0	0	0	0	1	0	1	0	0	0
CO.4	0	0	1	0	0	1	0	0	0	1	0

COs	**PSO1**	**PSO2**
CO.1	0	1
CO.2	0	0
CO.3	1	3
CO.4	0	0

Assessments :

Assessment	**Weightage (Marks)**
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).

- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Foundations of Environmental Law & Governance Ancient Indian approach and historical development of environmental laws in India. Constitutional Framework: Provisions related to environment (Articles 14, 19, 21, 48A, 51A(g)); Environmental planning in Five-Year Plans and Sustainable Development Goals (SDGs). Fundamental Principles: Precautionary Principle, Polluter Pays Principle, Sustainable Development, and Public Trust Doctrine' Landmark judgments in the environmental field and the role of Public Interest Litigation (PIL).	**07 Hrs.**
Unit 2: Protection of Natural Resources & Sectoral Laws Water (Prevention and Control of Pollution) Act 1974; Air (Prevention and Control of Pollution) Act 1981 and respective Rules, Forest & Wildlife: Indian Forest Act 1927 and Forest Conservation Act 1980, Marine & Coastal Governance: Marine laws of India; Coastal Regulation Zone (CRZ) Notifications, Noise Pollution (Regulation and Control) Rules 2000	**08 Hrs.**
Unit 3: Integrated Environmental Management & Compliance Environment Protection Act (1986): Framework, Rules, and its role as an umbrella legislation. Environmental Impact Assessment (EIA) notification and procedure; Public Liability Insurance Act 1991. Solid Waste Management Rules, 2026, National Green Tribunal (NGT) – Objectives, Jurisdiction, and Powers.	**07 Hrs.**
Unit 4: International Environmental Law & Global Policy Stockholm Declaration on Human Environment (1972); Rio Conference on Environment and Development (1992 - Earth Summit). Kyoto Protocol and Paris Agreement (2015); The role of UNEP (United Nations Environment Programme), Ramsar Convention 1971	**08 Hrs.**

Textbooks:

1. Shantakumar S. — *Introduction to Environmental Law*
2. Saxena — *Environmental Planning and Management in India*
3. Lakshman — *International Environmental Law*
4. Singh S. — *Environmental Policies in India*
5. R. R. Gupta & S. N. Trivedi — *Environmental Law in India*
6. C. K. Takwani — *Environmental Law*

References:

1. All Environmental Legislation, Amendments & Rules – MoEFCC (Official)
2. MoEFCC Notifications – EIA, CRZ, Wetlands, etc.
3. Trivedi R. K., Hwang — *Handbook of Environmental Law, Acts, Guidelines, Compliances and Standards Vol. I & II*
4. Judgment Digest Tools – NGT & Supreme Court environment bench judgments

Class: Final Year B. Tech **Title of the Course:** Environmental Impact Assessment (OE-III) **Course No.:** UILOE0730	**L**	**T**	**P**	**Credit**
	02 hours per week	-	-	2

Course Pre-Requisite: Students shall have the knowledge of:

- Environmental Studies
- Sustainable Development concepts

Course Description:

This course introduces **Environmental Impact Assessment (EIA)** as a planning and decision-making tool used to evaluate the environmental consequences of development projects. It is designed for students from **all engineering disciplines** and focuses on **concepts, procedures, regulations, and practical relevance**, rather than technical modelling. The course enables students to understand how environmental considerations are integrated into project planning, policy decisions, and regulatory approvals to achieve **sustainable and responsible development**.

Course Learning Objectives:

1. Understand the purpose and importance of EIA in development projects.
2. Learn the steps involved in the EIA process and public participation.
3. Identify environmental impacts of projects and basic mitigation measures.
4. Understand the role of environmental laws and regulatory frameworks in project approval.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Explain the concept, objectives, and importance of Environmental Impact Assessment.	Cognitive (Understanding) L2
CO.2	Describe the stages of the EIA process and methods for identifying environmental impacts.	Cognitive (Understanding) L2
CO.3	Identify potential environmental impacts of development projects and suggest basic mitigation measures.	Cognitive (Applying) L3
CO.4	Interpret environmental clearance procedures and major environmental regulations related to EIA.	Cognitive (Applying) L3

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	**2**	**–**	**–**	**–**	**–**	**3**	**3**	**–**	**–**	**–**	**–**
CO2	**2**	**1**	**–**	**–**	**1**	**3**	**3**	**–**	**–**	**–**	**–**
CO3	**2**	**2**	**1**	**–**	**1**	**3**	**3**	**–**	**–**	**–**	**–**
CO4	**1**	**1**	**–**	**–**	**–**	**3**	**3**	**–**	**–**	**1**	**–**

COs	**PSO1**	**PSO2**
CO1	**1**	
CO2	**1**	**1**
CO3	**2**	**1**
CO4	**1**	

Assessments:

Assessment	**Weightage (Marks)**
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).

- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Introduction to Environment, Development and Environmental Impact Assessment: Environment and development; need for environmental protection; concept, objectives, benefits and limitations of Environmental Impact Assessment (EIA); role of EIA in sustainable development; examples of projects requiring EIA; overview of EIA Notification (2006); project categorization; role of regulatory authorities in environmental clearance process.	**07 hours**
Unit 2: EIA Process and Environmental Impact Assessment Methods Stages of EIA including screening, scoping, baseline studies, impact prediction, mitigation and decision-making; types of environmental impacts; impact identification methods such as checklists, matrices and networks (conceptual); qualitative and quantitative assessment methods; introduction to environmental indices including Air Quality Index (AQI) and Water Quality Index (WQI); uncertainty in impact assessment.	**08 hours**
Unit 3: Environmental Management, Monitoring and Public Participation Environmental Management Plan (EMP)—purpose and components; mitigation measures; environmental monitoring; compliance reporting and post-clearance monitoring; role of engineers and project proponents in environmental management; public consultation and public hearing process; stakeholder involvement; transparency and accountability; role of NGOs and local communities; introduction to Strategic Environmental Assessment (SEA) and comparison between EIA and SEA.	**08 hours**
Unit 4: Environmental Laws, Governance and Case Studies Overview of major environmental legislations including Environment (Protection) Act, Water Act and Air Act; role of Pollution Control Boards; environmental clearance mechanism; case studies of infrastructure, industrial and energy projects; environmental issues related to traffic management, building construction and carbon footprint.	**07 hours**

Textbooks:

1. EnvironmentalImpactAssessment-CanterL.W.;McGrawHillPublishers
2. ManualofEnvironmentalImpactAssessment-Govt.ofIndiaPublication
3. HandbookofEnvironmentalImpactAssessment-KulkarniV.S,KaulN,TrivediR.K.,ScientificPublishers
4. TechnicalEIAGuidanceManualforIndustrialEstatesforMOEFGovt.ofIndiabyIL&FSEcosmart Ltd.,Hyderabad
5. AllEnvironmentalLegislations,amendments,rulespublishedbyMoEFCC.

ReferenceBooks

1. EnvironmentalPlanningandManagementinIndia –Saxena
2. HandbookofEnvironmentalLaw,Acts,Guidelines,CompliancesandStandardsVol.I,II-TrivediR.K.
3. EnvironmentalLaw-TripathiS.C.
4. EnvironmentalLawCasebook-LeelakrishnanP.EnvironmentalManagement,KulkarniVandRamachandraTV,2009.TERIPress,New Delhi

Class: Final Year B. Tech Civil and Environmental Engineering **Title of the Course:** Treatability Studies Laboratory **Course Code:** UCEPC0731	**L**	**T**	**P**	**Credits**
	-	-	02 hours per week	01

Course Pre-Requisite:

- Environmental Chemistry and Microbiology Laboratory (UCEPC0432)
- Water Treatment Laboratory (UCEPC0531)
- Wastewater Engineering Laboratory (UCEPC0631)

Course Description:

This course provides hands-on experience in planning, conducting, and analyzing laboratory experiments related to water and wastewater treatment processes. It enables students to interpret experimental data using standard methods to support sound environmental engineering decisions.

Course Learning Objectives:

1. To impart the basic knowledge to students to compile, analyze, and present geospatial data.
2. To develop creative thinking among students for solving real problems commonly addressed with Geospatial Technology.

Course Outcomes:

COs	**After the completion of the course, the students will be able to**	**Bloom's Taxonomy Descriptor**
CO.1	Develop (Plan, design, and conduct) experiments using appropriate techniques and tools	Cognitive (Analyzing) L3
CO.2	Analyze and interpret the experimental results.	Cognitive (Creating) L4

CO-PO Mapping:

CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CO1	2	1	1	3	3	1	-	2	1	1	2
CO2	2	2	-	3	2	2	-	1	1	-	2

COs	**PSO1**	**PSO2**
CO1	2	3
CO2	3	3

Assessments:

Assessment	**Weightage (Marks)**
ISE	25
ESE (OE)	25

- **ISE:** Based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
- **ESE (OE):** Assessment is based on oral examination.

Course Contents:

Experiment No. 1: Determination of gas transfer coefficient.	**2 Hours**
Experiment No. 2: Determination of BOD rate constant for domestic wastewater**.**	**4 Hours**
Experiment No. 3: Development of a breakthrough curve for the ion exchange process.	**8 Hours**
Experiment No. 4: Development of an adsorption isotherm.	**2x2 Hours**

Experiment No. 5: Determination of MLSS, MLVSS, and SVI in activated sludge collected from STP.	**2x2 Hours**
Experiment No. 6: Determination of F/M ratio in activated sludge collected from STP.	**2x2 Hours**
Experiment No. 7: Determination of volatile fatty acid and alkalinity in activated sludge collected from STP.	**2x2 Hours**

Reference Books:

1. Wastewater Engineering treatment and reuse – Metcalf & Eddy, Inc., George Tchobanoglous, Franklin Burton, H. David Stensel, McGraw-Hill Education, 2002
2. Chemistry for Environmental Engineering and Science, Clair N Sawyer, Perry L. McCarty, Gene F. Parkin, McGraw-Hill Education, 2003
3. *Standard Methods for the Examination of Water and Wastewater* by American Public Health Association, American Water Works Association, Water Environment Federation, 2005
4. IS 3025: Methods of sampling and test (physical and chemical) for water and wastewater

Class: B.Tech Civil and Environmental Engineering **Title of the Course:** Quantity Surveying and Valuation Laboratory **Course No.:** UCEPC0732	**L**	**T**	**P**	**Credits**
	-	-	02 hours per week	01

Course Pre-Requisite:

- Students must have knowledge about numerical and mathematical applications in solving problemsof area and volume measurements
- Students must have knowledge of mode of measurement for various building components.
- Students must be able to plan & design G+1 structures

Course Description:

The course explores the basic knowledge and fundamentals of estimation of various Civil & Environmental Structures. The course involves the skills in measuring various components of structures, estimation of Various items required for construction work. Also, it imparts skill of valuation of existing structures with standard format.

Course Learning Objectives:

1. To learn units of measurement for various civil engineering items
2. To perform cost estimation for entire civil & environmental projects
3. To understand the various valuation methods.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Taxonomy Descriptor**
CO1	Analyze rates of various items, materials and labors of Civiland Environmental Engineering Works.	Cognitive (Analyzing) L4
CO2	Determine cost estimate and valuation of Civil andEnvironmental Engineering Works.	Cognitive (Evaluating) L5

CO-PO Mapping:

CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CO1	3	2	-	-	2	-	-	-	-	-	1
CO2	2	-	-	-	2	-	-	-	1	-	3

Cos	**PSO1**	**PSO2**
CO1	-	2
CO2	-	2

Assessments:

Assessment	**Weightage (Marks)**
ISE	25
ESE (POE)	25

- **ISE:** Based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
- **ESE (POE):** Assessment is based on Practical oral examination.

Course Contents:

Assignment No. 1: Rate Analysis of ten items of Civil and Environmental Engineering works. 1. Earthwork 2. Cement Mortar 3. Concrete Work 4. Brick Work 5. Stone work 6. Plastering	6 Hours

7. Steel work 8. Flooring 9. Wood Work 10. White Washing	
Assignment No. 2: Detailed specification for minimum ten items of Civil and Environmental Engineering works. 1. Excavation 2. Plain and R.C.C. Work 3. Masonry Work 4. Centering and Formwork 5. Wood Work, Doors, Windows 6. Roof Covering 7. Water Supply 8. Plumbing and Sanitary Fittings 9. Drainage and Sewerage 10. Miscellaneous Building Items.	4 Hours
Assignment No. 3: Detailed Estimate of a Residential building	8 Hours
Assignment No. 4: Preparing detailed estimate for any one of the following 1. Water treatment plant or sewage treatment plant 2. Water supply line 3. Sewerage line 4. 1 KM of road 5. 1 KM of Canal	34Hours
Assignment No. 5: Preparation of Bar bending Schedule	4 Hours
Assignment No. 6: Valuation report for G+1 Building	2 Hours
Assignment No. 7: Assignment based upon use of Microsoft Excel in quantity surveying	2 Hours

Textbooks:

1. Estimating and Costing –B. N.Datta, 24th edition, UBS publishers Pvt Ltd.
2. Estimating, costing and specifications in civil engineering – Chakraborty M., Publications: M. Chakraborty, ISBN-10 818530436X
3. Estimating and Costing –G.S. Birdi, DhanpatRai publishing company.

References:

4. District Schedule of Rates for PWD, MJP
5. Quantity Surveying – P. L. Bhasin
6. Elements of estimating and costing – S. C. Rangawala.
7. Civil Engg. Contracts and Estimates – B. S. Patil
8. Professional Practice – RoshanNamavati (Estimating and Valuation)
9. Bombay P. W. D. volumes I and II 7. Valuation of real properties – S. C. Rangawala.

Class: Final Year B. Tech Civil Environmental Engineering **Title of the Course:** Project-I **Course Code:** UCEIL0771	**L**	**T**	**P**	**Credits**
	-	-	08	04

Course Pre-Requisite:

Students shall have the knowledge of:

- Fundamentals and Applications in Environmental Engineering,
- Professional Communication,
- Research Methodology

Course Description:

Project-I is designed to provide students with an opportunity to initiate an independent or group-based engineering project by applying knowledge gained throughout the Environmental Engineering program. This course focuses on problem identification, literature review, research gap analysis, and preparation of a structured research plan under the guidance of a faculty supervisor. Students will work individually or in small groups to develop technical competence, research aptitude, project planning skills, and professional ethics required for engineering practice. The course represents the initiation phase of the final year project, forming the foundation for detailed analysis, experimentation, modelling, and implementation to be carried out in Project II in an academic, industrial, or research environment.

Course Learning Objectives:

The Course Objectives are to give an opportunity to students to,

1. Acquire the ability to make links across different areas of knowledge.
2. Develop collaborative skills to present ideas clearly and coherently.
3. Formulate new scientific questions that came up during project performance.
4. Learn on their own to evaluate ideas and take appropriate actions.
5. Show a professional attitude regarding time planning, collaboration, innovation and ethical issues.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive Descriptor**
CO1	Perform a literature review to identify, formulate the research problem and enlist expected outcomes.	Psychomotor (Perception) L1
CO2	Undertake research work using theoretical studies, experimentations and computer simulations.	Psychomotor (Readiness to Act) L2
CO3	Establish findings for describing the work undertaken, results and conclusions within the specified time frame.	Psychomotor (Ability to Perform) L5
CO4	Synthesize knowledge for creatively evaluating ideas and information to apply it to real life situations.	Psychomotor (Create) L6
CO5	Present the research work in a forum involving oral and/ or poster presentations.	Affective (Organization) L4

CO-PO-PSO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	2	–	–	–	–	–	–	–
CO2	2	2	2	2	2	–	–	–	–	–	–
CO3	2	1	2	1	–	–	–	–	1	2	–
CO4	1	2	2	–	–	2	–	–	–	–	2

CO5	–	–	–	–	–	–	–	–	3	1	–

CO	PSO1	PSO2
CO1	2	1
CO2	2	2
CO3	2	2
CO4	2	2
CO5	1	1

Assessments:

Assessment	Weightage (Marks)
ISE-1	50
ISE-2	50

- **ISE – I and ISE – II:** Assessment of 100 Marks is based on at least two Internal Oral and/ or Poster Presentations divided into Part A (50 Marks) and Part B (50 Marks).

Course Content:

The work to be completed shall consist of:

- Literature Review, Research Gap and Content.
- Objectives and Motivation.
- Research Design, Process, Methodology, Data Collection.
- Development and evaluation of links across different areas.
- Pre-tests, Results, Discussions, Findings and Limitations.

Term work:

The internal assessment and evaluation shall be based on at least two presentations highlighting following points:

- Theoretical background and literature review,
- Significance and relevance,
- Proposed objectives, work plan and research design,
- Extent of work performed and findings of the research work,
- Interdisciplinary approach,
- Application utility and
- Social, economic, technical aspects.

The internal assessment and evaluation for per batch shall be done by a committee consisting of the Head of the Department, two Senior Faculty Members (Subject Experts) of the Department, Research Supervisor and Co-Research Supervisor (if any). Each project batch shall submit soft copies and hard copies of their research synopsis and progress report duly signed by the Research Supervisor, Co-Research Supervisor (if any), two Senior Faculty Members (Subject Experts) of the Department, Head of the Department and Head of the Institution to the Research Supervisor, Co-Research supervisor (if any), Department and Examination Section.

Class: Final year B. Tech Civil and Environmental Engineering **Title of the Course:** Mathematical Modelling and Simulation (MDM DS-V) **Course No.:** UCEMM0741	**L**	**T**	**P**	**Credit**
	03 hours per week	-	-	3

Course Pre-Requisite: Students shall have the knowledge of:

- Introduction to Data Science
- Statistics for Data Science
- Python for Data Science
- Data Analytics

Course Description:

This course introduces **mathematical modelling and simulation concepts** with specific applications to **environmental engineering systems**, using **data-driven approaches and Python programming**. The focus is on understanding how environmental processes can be represented using simple mathematical models, calibrated using real or simulated data, and analyzed through computational simulations. Emphasis is placed on **conceptual modelling, interpretation of results, and decision-making**, rather than advanced numerical methods or software development. The course equips students with practical skills to analyze environmental data, simulate system behaviour, and support planning and management of environmental systems.

Course Learning Objectives:

1. Understand the role of mathematical modeling and simulation in environmental engineering.
2. Develop simple mathematical models for environmental processes using data-driven approaches.
3. Apply Python-based tools to simulate and analyze environmental systems.
4. Interpret model outputs for environmental decision-making and sustainability planning.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Explain fundamental concepts of mathematical modelling and simulation in environmental engineering.	Cognitive(Understanding) L2
CO.2	Formulate simple mathematical models for environmental systems using data and assumptions.	Cognitive (Applying) L3
CO.3	Apply Python-based simulation techniques to analyze environmental engineering problems.	Cognitive (Applying) L3
CO.4	Interpret simulation results to support environmental management and engineering decisions.	Cognitive (Analysing) L4

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2	1	–	–	–	1	–	–	–	–	–
CO2	3	2	2	–	1	2	–	–	–	–	–
CO3	3	2	2	–	2	2	–	–	–	–	–
CO4	2	3	2	–	–	3	–	–	–	–	1

COs	**PSO1**	**PSO2**
CO1	1	1
CO2	2	2
CO3	2	2
CO4	3	2

Assessments:

Assessment	**Weightage (Marks)**
ESE	100

- **ESE:** Assessment is based on 100% course content

Course Contents:	
Unit 1: Introduction to Modelling and Simulation in Environmental Engineering Concept of systems and models; types of models—physical, conceptual, mathematical, and data-driven; deterministic vs stochastic models; static vs dynamic models; role of modelling in environmental engineering; limitations and uncertainty in models; overview of simulation workflow using Python.	**07 hours**
Unit 2: Mathematical Representation of Environmental Processes Basic mass balance concepts; steady-state and unsteady-state models; simple algebraic and differential equations in environmental systems; population growth models; pollutant transport basics; model assumptions and simplifications for environmental applications.	**07 hours**
Unit 3: Data-Driven Modelling Using Python Environmental data types and sources; data preprocessing and visualization; regression models (linear and multiple); correlation and trend analysis; fitting models using Python libraries (NumPy, Pandas, Matplotlib, SciPy – conceptual use); interpretation of model parameters.	**08 hours**
Unit 4: Simulation of Environmental Systems Simulation concepts; time-based simulations; numerical solution of simple differential equations (Euler method – conceptual); simulation of water quality systems, air pollution dispersion (basic), population and resource models; scenario analysis and sensitivity analysis.	**07 hours**
Unit 5: Modelling Applications in Environmental Engineering Water supply and demand modelling; wastewater treatment process modelling (conceptual); air quality index modelling; solid waste generation forecasting; climate-related environmental indicators; use of models in environmental impact assessment and planning.	**07 hours**
Unit 6: Model Evaluation, Uncertainty, and Decision Support Model calibration and validation; goodness-of-fit indicators (R^2, RMSE – concept level); uncertainty and limitations in environmental models; ethical and responsible use of models; role of modelling and simulation in policy-making and sustainable development; brief case studies.	**08 hours**

Textbooks:

1. Chapra, S. C., Surface Water-Quality Modeling, McGraw-Hill, 1st Edition, 1997.
2. Beck, M. B., Environmental Foresight and Models, Elsevier, 1st Edition, 2002.
3. Montgomery, D. C., Runger, G. C., Applied Statistics and Probability for Engineers, Wiley, 7th Edition, 2018.

ReferenceBooks

1. Jørgensen, S. E., Fundamentals of Ecological Modelling, Elsevier, 5th Edition, 2016.
2. Lindstrom, M., Environmental Modelling Using Python, CRC Press, 1st Edition, 2020.
3. Wes McKinney, Python for Data Analysis, O'Reilly Media, 2nd Edition, 2018.
4. EPA Manuals on Environmental Modelling and Decision Support Systems.

Class: Final Year B. Tech Environmental Engineering **Title of the Course:** Introduction to Financial Management (MDM-HRM) **Course No.:** UCEMM0742	**L**	**T**	**P**	**Credit**
	03 hours per week	-	-	3

Course Pre-Requisite:

Students shall have the knowledge of:

- Algebra and Engineering Mathematics
- Engineering Management
- Basics of Human Resource Management

Course Description:

This course introduces fundamental concepts of financial management with a strong emphasis on their application in engineering projects, environmental infrastructure, sustainability initiatives, and organizational decision-making. The course enables students to understand how financial principles support planning, evaluation, and execution of engineering and environmental projects. It integrates financial analysis with real-world considerations such as risk, sustainability, resource efficiency, and project viability, preparing environmental engineering graduates to make informed techno-economic decisions in professional practice.

Course Learning Objectives: Students will be able to:

1. Understand core principles and functions of financial management in engineering organizations.
2. Apply financial planning and analysis tools to engineering and environmental projects.
3. Explain time value of money, risk–return trade-offs, and cost of capital concepts.
4. Analyze capital budgeting decisions for infrastructure and sustainability projects
5. Understand working capital management in project and organizational contexts.
6. Interpret dividend decisions, sources of finance, and financial statements for decision-making.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Explain fundamental concepts, objectives, and functions of financial management in engineering and environmental projects.	Cognitive (Understanding) L2
CO.2	Apply financial planning, time value of money, and cost of capital concepts to evaluate engineering and sustainability projects.	Cognitive (Applying) L3
CO.3	Analyze capital budgeting and working capital decisions using appropriate financial evaluation techniques.	Cognitive (Analysing) L4
CO.4	Interpret dividend policies, sources of finance, and basic financial statements for managerial and project-related decision-making.	Cognitive (Applying) L3

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	1	–	–	2	–	–	–	–	–
CO2	3	2	2	–	–	2	–	–	–	–	–
CO3	2	3	2	–	–	2	–	–	–	–	–
CO4	2	2	1	–	–	1	–	–	–	2	–

COs	**PSO1**	**PSO2**
CO1	–	–
CO2	1	1
CO3	1	2
CO4	–	1

Assessments:

Assessment	**Weightage (Marks)**
ESE	100

- **ESE:** Assessment is based on 100% course

Course Contents:	
Unit 1: Introduction to Financial Management and Engineering Applications Meaning, objectives, and scope of financial management; role of finance in engineering and infrastructure organizations; finance functions—investment, financing, liquidity, and dividend decisions; risk–return trade-off; relevance of financial management in environmental and sustainability projects; overview of financial decision-making in public and private sector projects, carbon pricing.	**07 Hrs.**
Unit 2: Time Value of Money and Risk Analysis Concept of time value of money; simple and compound interest; present value and future value; annuities; discounting and compounding techniques; application of TVM in engineering projects; risk and return concepts; types of risk; introduction to risk assessment in infrastructure and environmental projects.	**07 Hrs.**
Unit 3: Cost of Capital and Capital Structure Concept and significance of cost of capital; cost of equity, debt, and preference capital; weighted average cost of capital (WACC); theories of capital structure; optimum capital structure; relevance of cost of capital in project appraisal and sustainable investment decisions.	**08 Hrs.**
Unit 4: Capital Budgeting and Project Appraisal Capital budgeting concept and importance; methods of capital budgeting—Payback Period, Net Present Value (NPV), Internal Rate of Return (IRR), Profitability Index, Accounting Rate of Return; limitations of methods; application of capital budgeting to environmental, renewable energy, water supply, and waste management projects; basics of break-even analysis**.**	**07 Hrs.**
Unit 5: Working Capital Management Concept and significance of working capital; estimation of working capital requirements; management of cash, receivables, and inventory; operating cycle; working capital management in construction, infrastructure, and environmental projects; liquidity management and short-term financing.	**07 Hrs.**
Unit 6: Dividend Policy, Sources of Finance, and Financial Statements Dividend—meaning, types, and policies; determinants and theories of dividend policy; sources of finance—long-term, medium-term, and short-term; role of financial institutions; basics of financial statements—balance sheet, income statement, and cash flow statement; interpretation of financial statements for engineering and environmental decision-making.	**08 Hrs.**

Textbooks:

1. Financial Management by I.M. Pandey Vikas Publishing House PVT Ltd.
2. Financial Management Theory and practice by Prasanna Chandra Tata McGraw Hill co. Chennai.
3. Financial Management by Rajiv Srivastava & Anil Misra, Oxford University Press, Chennai
4. Financial management – Preeti Singh Ane books – PVT Ltd., Chennai.

References:

1. Financial Management by D. Chandra Bose, PHI learning India PVT Ltd., www.phindia.com
2. Financial Management Text and cases – Cengage learning – By Brigham &Ehrhardt India edition.
3. Financial Management Text, problem and cases – My. Khan and PK. Jain Tata McGraw-Hill Co.
4. Financial Management – Bhabatosh Banerjee – PHI Learning PVT Ltd.,
5. Financial Management India Edition, James C.VAN Horne &Joh. M. Wachowfcz, PHIlearning Private Ltd.,
6. Financial Management – By P. Periasamy Tata McGraw Hill Co.

Semester 8

Class: B.Tech Civil and Environmental Engineering **Title of the Course:** Advanced ConstructionTechnology **Course No.:** UCEPE0811	**L**	**T**	**P**	**Credits**
	03 hours per week	---	---	03

Course Pre-Requisite:

Students shall have the knowledge of:

- Basic Civil Engineering
- Concrete Technology

Course Description:

This course will help the students to understand technologies involved in construction sector. This course will cover various technologies involved in construction of various structure, their standard procedures, suitability, significance, advantages and disadvantages.

Course Learning Objectives:

1. To understand various technologies used in construction sector.
2. To understand different types of temporary structures.
3. To understand advance concrete processes.
4. To understand different methods of excavation.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Explain underwater construction methods and groundwater control techniques.	Cognitive (Understanding) L2
CO.2	Apply modern construction methods for foundations, basements, and underground works.	Cognitive (Apply) L3
CO.3	Use advanced concrete and pavement construction technologies.	Cognitive (Apply) L3
CO.4	Select appropriate equipment for aggregate production and structural rehabilitation.	Cognitive (Analyse) L4

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO.1	-	-	1	-	-	-	-	1	-	-	2
CO.2	-	-	-	1	1	-	-	-	-	-	2
CO.3	-	-	-	-	-	-	-	-	1	2	2
CO.4	-	-	-	-	1	-	-	1	-	-	2

COs	**PSO1**	**PSO2**
CO.1	-	2
CO.2	-	2
CO.3	-	2
CO.4	-	2

Assessments:

Assessment	**Weightage (Marks)**
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group

Discussions etc. (For each ISE two different tools are to be used).

- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit: 1 Underwater Construction a) Coffer Dams:Introduction, definition, types of coffer dams, selection of coffer dams, designfeatures of coffer dams, leakage prevention and economical height of cofferdam. b) Control of Ground water in Excavations: Introduction, methods: pumping, well points, bore wells, electro-osmosis, chemical,freezing process, vibro-flotation.	07 Hrs.
Unit: 2 Modern Construction Methods Open excavation, shafts and tunnels, pile, pier and caisson foundations. Basement construction – construction methods - supporting the excavations – control of ground water - shoring and underpinning – basement waterproofing, Building Information Modelling	07 Hrs.
Unit: 3 Advance concrete technology Sprayed concrete; underwater concrete; grouts, grouting and grouted concrete; mass concrete; pumped concrete; concrete for liquid retaining structures; vacuum process; concrete coatings and surface treatments, RMC	07 Hrs.
Unit :4 Pavement Construction Construction of concrete pavement by techniques like vacuumprocessingRevibrating concrete, Roller –compacted concrete.Use of techniques like slip form paving in pavement construction; usingWet MIX macadam in Road. Advanced Techniques, vacuum dewatering inconcrete slab construction,	08 Hrs.
Unit :5 Aggregate Production Equipment for production of aggregate and concrete: Crushers – feeders – screening equipment – batching and mixing equipment – hauling, pouring and pumping equipment – transporters.	08 Hrs.
Unit :6 Structural Rehabilitation Refurbishment and Protection Techniques - Routing and Sealing - Stitching - External Stressing - Resin Injection - Grouting - Blanketing -Overlays - Sprayed Concrete - Prepacked Concrete - Dry packing - Jacketing - Plate Bonding -Protective Coatings - Autogenous Healing - Vacuum Impregnation - Chloride Extraction - Cathodic Protection.	08 Hrs.

Textbooks:

1. Developing New Entrepreneurs - Entrepreneurship Development Institute of Formworkdesign and construction---- Wynn
2. Concrete Technology--- M.S. Shetty S.Chand publication

References:

1. Handbook of Composite construction Engg--- G.M. Sabanis
2. Formwork design and construction---- Wynn
3. Bridge Engineering--- Raina
4. Bridge engineering Punnuswamy

Class: Final Year B. Tech Civil and Environmental Engineering **Title of the Course:** Industrial Wastewater Treatment **Course No.:** UCEPE0812	**L**	**T**	**P**	**Credit**
	03 hours per week	-	-	3

Course Pre-Requisite:

Students shall know:

- Environmental chemistry and microbiology
- Water & wastewater engineering.

Course Description:

The course is designed to provide an understanding of the alternate processes available to treat wastewaters from industrial activities prior to its disposal as well as for potential reuse and recycling. As the characteristics of wastewater differ from industry to industry, knowledge of the manufacturing process is necessary to understand the specific treatment needed to meet the stipulated standards as per the consent. The common effluent treatment plants are very useful to ensure full-fledged treatment of wastewater from small-scale industries with potential reuse and recycling.

Course Learning Objectives:

At the end of this course, students will

1. Understand the industrial process, water utilization, and wastewater characteristics from different industries
2. Provide an understanding of the benefits and techniques of waste minimization in industries
3. Impart knowledge on the selection of treatment methods for industrial wastewater to meet disposal standards
4. Gain understanding of common effluent treatment plants

Course Outcomes:

COs	**After the completion of the course, the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Describe industrial water use, types of industries, and impacts of untreated effluents.	Cognitive (Understanding) L2
CO.2	Apply waste minimization and zero discharge concepts in industrial wastewater management.	Cognitive (Applying) L3
CO.3	Analyze industrial processes and wastewater characteristics from major industrial sectors.	Cognitive (Analyzing) L4
CO.4	Suggest treatment methods for the removal of specific industrial pollutants.	Cognitive (Applying) L3

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO.1	3	2	-	-	-	2	-	-	1	-	-
CO.2	2	2	3	-	-	3	-	-	-	1	-
CO.3	2	3	-	2	-	2	-	-	-	-	-
CO.4	2	2	3	-	-	3	-	-	-	-	-

COs	**PSO1**	**PSO2**
CO.1	3	2
CO.2	3	3
CO.3	3	3
CO.4	3	3

Assessments :

Assessment	**Weightage (Marks)**
ISE-1	10
MSE	30

ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE, two different tools are to be used).
- **MSE:** Assessment is based on 50% of the course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Use of water and impact of untreated industrial wastewater Industrial scenario in India, Categories of industries, General water requirements in industry, Water budget, Environmental impacts of untreated industrial wastewater, Effluent standards, Characterization studies, Classification of treatment	**6Hours**
Unit 2: Waste minimization and treatment Concepts of waste minimization in industries, Methods of waste volume and strength reductions, 4 R concept of Waste minimization, zero discharge concept, Concept of Common Effluent Treatment Plant- Objectives, Types of CETP, Technical and financial aspects	**6 Hours**
Unit-3 Agro-based industries Manufacturing processes, Water usage, Sources, quantities, and characteristics of effluents (process stream and combined), Pollution effects, Alternative methods of treatment, Waste Reduction/Byproduct recovery for various Agro-based industries: Sugar, Distillery, Pulp and paper mill, Dairy, and Textile industries	**12 Hours**
Unit-4 Chemical industries Manufacturing processes, Water usage, Sources, quantities, and characteristics of effluents (process stream and combined), Pollution effects, Alternative methods of treatment, Waste Reduction/Byproduct recovery, and disposal for various Chemical industries: Fertilizers, Tannery, Petroleum and Oil refineries	**7 Hours**
Unit 5: Engineering industries Manufacturing processes, Water usage, Sources, quantities, and characteristics of effluents (process stream and combined), Pollution effects, Alternative methods of treatment, Waste Reduction/Byproduct recovery, and disposal for Engineering industries: Steel, Foundries, Battery manufacturing, wastewater from electronic assembly/E-waste recycling	**7 Hours**
Unit 6: Treatment for removal of specific pollutants Removal of Heavy metals, Cyanide, Treatment for radioactive wastes, Biological treatment for Toxic waste	**6 Hours**

Textbooks:

1. Patwardhan. A.D., Industrial Wastewater Treatment", Prentice Hall of India, New Delhi 2010. ISBN-978-81-203-5332-9
2. Rao M. N. & Dutta A. K. , "Wastewater Treatment", Oxford – IBH Publication, 1995.

References:

1. "Theories and Practices of Industrial Waste Treatment", Nelson Nemerow, Wiley Publication Company.
2. "Wastewater Engineering Treatment and Reuse", Metcalf and Eddy, Tata McGraw Hill Publication.
3. Eckenfelder W.W. Jr., "Industrial Water Pollution Control", McGraw Hill Book Company, New Delhi, 2000.
4. "Pollution Prevention: Fundamental & Practice", Bishop, P.L., McGraw-Hill, 2000.

Class: Final year B. Tech Civil and Environmental Engineering **Title of the Course:** Urban and Rural Planning (PE-IV) **Course No.:** UCEPE0813	**L**	**T**	**P**	**Credit**
	03 hours per week	-	-	3

Course Pre-Requisite: Students shall have the knowledge of:

- Fundamentals of Environmental Engineering
- Environmental Studies and Sustainable Development concepts
- Engineering Mathematics
- Basics of Geography, Demography, and Land Use Planning

Course Description:

This course introduces the principles, concepts, and practices of urban and rural planning with emphasis on environmental sustainability, infrastructure planning, and quality of life. It focuses on understanding the growth of urban and rural settlements, land use planning, housing, transportation, water supply, sanitation, solid waste management, and environmental considerations in planning processes. The course equips students with the ability to analyse planning issues, interpret spatial and demographic data, and propose sustainable planning solutions for urban and rural regions in India. Emphasis is placed on environmental management, climate resilience, inclusive development, and regulatory frameworks relevant to planning practice.

Course Learning Objectives:

1. Understand fundamental concepts and principles of urban and rural planning.
2. Analyze urban and rural development issues with environmental perspectives.
3. Apply planning principles for sustainable infrastructure and land use management.
4. Interpret planning regulations and environmental policies for development planning.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Explain concepts, principles, and objectives of urban and rural planning.	Cognitive (Understanding) L2
CO.2	Analyse urbanization and rural development issues affecting environment and public health.	Cognitive (Analysing) L4
CO.3	Apply planning principles for sustainable land use, infrastructure, and services.	Cognitive (Applying) L3
CO.4	Interpret planning standards, regulations, and policies for development planning.	Cognitive (Applying) L3

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2	1	–	–	–	2	–	–	–	–	–
CO2	2	3	2	–	–	3	–	–	–	–	–
CO3	3	2	3	–	1	3	–	–	–	–	–
CO4	2	2	2	–	–	3	–	–	–	1	–

COs	**PSO1**	**PSO2**
CO1	2	1
CO2	3	1
CO3	2	2
CO4	2	1

Assessments:

Assessment	**Weightage (Marks)**
ISE-1	10
MSE	30
ISE-2	10

ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Introduction to Urban and Rural Planning Concept and scope of planning; objectives and principles of urban and rural planning; role of planners and environmental engineers; evolution of towns and villages in India; urbanization trends; planning process and hierarchy of plans.	**07 hours**
Unit 2: Urban Planning Principles and Land Use Planning Urban land use planning; zoning concepts; residential, commercial, industrial, recreational and public land uses; population forecasting; housing standards; urban density; environmental considerations in land use planning; green spaces and open spaces.	**07 hours**
Unit 3: Urban Infrastructure Planning Planning of water supply, sewerage, stormwater drainage, solid waste management, transportation systems; energy and communication infrastructure; environmental impacts of urban infrastructure; sustainable and smart city concepts, Intelligent Transportation Systems.	**08 hours**
Unit 4: Rural Planning and Development Characteristics of rural settlements; rural development planning; village planning concepts; land use in rural areas; water supply, sanitation, housing, waste management in rural areas; watershed-based planning; role of Panchayati Raj Institutions.	**07 hours**
Unit 5: Environmental and Social Aspects of Planning Environmental impact assessment in planning; urban environmental problems—air, water, noise, solid waste; climate change and resilient planning; inclusive planning; slum improvement and rehabilitation; public participation in planning.	**07 hours**
Unit 6: Planning Standards, Policies, and Regulations Planning standards and norms; development control regulations; master plans and regional plans; national urban and rural development policies; AMRUT, Smart Cities Mission, PMAY, Swachh Bharat Mission; role of environmental regulations in planning.	**08 hours**

Textbooks:

1. Rangwala, S. C., Town Planning, Charotar Publishing House, Anand, 25th Edition, 2019
2. Gallion, A. B. and Eisner, S., The Urban Pattern: City Planning and Design, CBS Publishers & Distributors, New Delhi, 5th Edition, 2016
3. Kadiyali, L. R., Traffic Engineering and Transport Planning, Khanna Publishers, New Delhi, 9th Edition, 2018

Reference Books

1. Hall, P., Urban and Regional Planning, Routledge, London, 5th Edition, 2014.
2. Ratcliffe, J., Stubbs, M. and Keeping, M., Urban Planning and Real Estate Development, Routledge, 4th Edition, 2019.
3. Ministry of Housing and Urban Affairs (MoHUA), URDPFI Guidelines, Government of India, New Delhi, 2015.
4. UN-Habitat, Planning Sustainable Cities: Global Report on Human Settlements, United Nations, 2016.
5. Chakrabarti, B. K., Regional Planning in India, Orient BlackSwan, 2nd Edition, 2017.

Class: Final Year Civil And Environmental Engineering **Title of the Course:** Environmental Impact Assessment and Legislation **Course No.:** UCEPE0814	**L**	**T**	**P**	**Credit**
	03 hours per week	-	-	3

Course Pre-Requisite: Students shall have the knowledge of:

- Environmental Studies
- Environmental Chemistry
- Environmental Governance / Environmental Management
- Basic Environmental Engineering Concepts

Course Description:

This course provides in-depth understanding of **Environmental Impact Assessment (EIA)** as a planning and decision-making tool, along with **environmental legislations and regulatory frameworks** governing developmental activities in India. The course emphasizes **systematic assessment of environmental impacts, mitigation planning, public participation, compliance monitoring, and legal provisions** for environmental protection. Students gain the ability to interpret EIA reports, understand statutory requirements, and apply environmental laws in the context of **sustainable development and environmental governance**.

Course Learning Objectives:

- Understand the need, scope, and process of Environmental Impact Assessment.
- Apply various methods for identification, prediction, and evaluation of environmental impacts.
- Interpret environmental legislations, rules, and regulatory requirements applicable to projects and industries.
- Relate EIA and environmental laws to sustainable development, environmental protection, and decision-making.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Explain the need, scope, process, and regulatory framework of Environmental Impact Assessment (EIA) in India.	Cognitive (Understanding) L2
CO.2	Apply appropriate methods and tools for identification, prediction, and evaluation of environmental impacts of developmental projects.	Cognitive (Applying) L3
CO.3	Interpret the provisions of major environmental laws, rules, and regulations related to pollution control and waste management.	Cognitive (Understanding) L2
CO.4	Analyze environmental clearance, compliance, and monitoring requirements in the context of sustainable development and environmental governance.	Cognitive (Analysing) L4

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2	1	–	–	–	3	2	–	–	–	–
CO2	3	3	2	–	1	3	–	–	–	–	–
CO3	2	2	–	–	–	3	2	–	–	–	–
CO4	2	3	2	–	–	3	2	–	–	1	1

COs	**PSO1**	**PSO2**
CO1	2	1
CO2	3	2
CO3	2	1
CO4	3	2

Assessments:

Assessment	**Weightage (Marks)**
ISE-1	10

MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Introduction to Environmental Impact Assessment Concept, objectives, and necessity of EIA; evolution and history of EIA; components of EIA studies; types of environmental impacts (direct, indirect, cumulative, short-term and long-term); planning and management of EIA studies; EIA implementation framework in India; EIA Notifications 1994, 2006, 2020 and subsequent amendments; EIA process as per Notification 2006—screening, scoping, baseline studies, impact prediction, mitigation measures, public consultation and public hearing procedure; project categorization (Category A, B1, B2); appraisal procedure; grant of environmental clearance; post-clearance monitoring and compliance reporting.	**09 hours**
Unit 2: Methods of Impact Identification and Assessment Baseline environmental data collection—physical, biological, and socio-economic components; impact identification methods—checklists, matrices (Leopold matrix), networks; impact prediction methodologies; mass balance approach; box model approach; basics of air quality dispersion modelling; use of indices such as WQI, AQI; assessment of impacts and formulation of mitigation measures; Comprehensive Environmental Pollution Index (CEPI) in India.	**09 hours**
Unit 3: EIA Documentation and Reporting Purpose and importance of EIA documentation; contents of Form-I and Form-I A; generic structure of EIA report; executive summary; environmental management plan (EMP); role of baseline, impact, and mitigation chapters; quality of EIA reports and common deficiencies.	**05 hours**
Unit 4: Environmental Legislations – Water and Air Acts Historical development of environmental legislations; evolution of environmental governance; National Environmental Policy (NEP); overview of international environmental legislations—USEPA, NEPA, Clean Air Act, Clean Water Act; Water (Prevention and Control of Pollution) Act, 1974 and Rules; Water Cess Act, 1977; Air (Prevention and Control of Pollution) Act, 1981 and Rules; roles and functions of CPCB and SPCBs; consent mechanisms.	**09 hours**
Unit 5: Environmental Protection Act and Waste Management Rules Environment (Protection) Act, 1986—scope, powers, and provisions; rules framed under EPA; E-Waste Management Rules, 2016; Construction and Demolition Waste Management Rules, 2016; Batteries Waste Management Rules, 2022; Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987; Fly Ash Utilization Notification.	**09 hours**
Unit 6: Special Environmental Regulations and Emerging Concepts Coastal Regulation Zone (CRZ) Notification—objectives, classification, and guidelines; Eco-Sensitive Zones (ESZ)—concept and regulatory framework; Strategic Environmental Assessment (SEA)—concept, need, and comparison with EIA; requirements and scope of Marine EIA.	**04 hours**

Textbooks:

1. EnvironmentalImpactAssessment-CanterL.W.;McGrawHillPublishers
2. ManualofEnvironmentalImpactAssessment-Govt.ofIndiaPublication
3. HandbookofEnvironmentalImpactAssessment-KulkarniV.S,KaulN,TrivediR.K.,ScientificPublishers
4. TechnicalEIAGuidanceManualforIndustrialEstatesforMOEFGovt.ofIndiabyIL&FSEcosmart Ltd.,Hyderabad
5. AllEnvironmentalLegislations,amendments,rulespublishedbyMoEFCC.

ReferenceBooks

1. EnvironmentalPlanningandManagementinIndia –Saxena
2. HandbookofEnvironmentalLaw,Acts,Guidelines,CompliancesandStandardsVol.I,II-TrivediR.K.

3. EnvironmentalLaw-TripathiS.C.
4. EnvironmentalLawCasebook-LeelakrishnanP.EnvironmentalManagement,KulkarniVandRamachandraTV,2009.TERIPress,New Delhi

Class: Final Year B. Tech. Civil and Environmental Engineering **Title of the Course:** Environmental Management System **Course No.:** UCEPE0815	**L**	**T**	**P**	**Credits**
	03	---	---	03

Course Pre-Requisite:

Students shall have the knowledge of:

- Environmental legislations
- Activities related to environment in industries
- Best practices for environmental management

Course Description:

Environmental Management Systems course deals with the implementation of effective environmental management system in organizations managing the various environmental aspects. The course emphasizes on the requirements prescribed in ISO 14001:2015. ISO 14001:2015 standard is an International Standard followed worldwide for the environmental management in organizations.

Course Learning Objectives:

1. Understand the scope of ISO 14001:2015 Environmental Management System standard.
2. Learn the requirements of ISO 14001: 2015 Environmental Management System standard.
3. Understand the requirements & procedures for EMS audit.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO1	Explain the terms used in ISO 14001 and ISO 19011 standards.	Cognitive (Understanding) L2
CO2	Outline requirements of planning and implementation in EMS.	Cognitive (Understanding) L2
CO3	Illustrate the process and requirements of EMS Audit as per ISO 19011.	Cognitive (Understanding) L2
CO4	Identify the requirements of checking and management review in EMS.	Cognitive (Applying) L3

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1								**2**		**2**	
CO2								**2**		**2**	
CO3								**2**		**2**	
CO4								**2**		**2**	

COs	**PSO1**	**PSO2**
CO1		
CO2		
CO3		
CO4		

Assessments:

Assessment	**Weightage (Marks)**
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Introduction to ISO, ISO History, Need of International Standards, Standard Development Process, Benefits of ISO Standards, Environmental Management System (EMS) and Sustainable Development, Concept of Life Cycle Analysis, Aim of EMS, Deming's PDCA Cycle, Scope of ISO 14001:2015 Standard, Terms and Definitions.	08 Hours
Unit 2: Leadership and Commitment, Environmental Policy, Organizational Roles, Responsibilities and Authorities, Planning, Actions to address Risks and Opportunities, General Requirements, Environmental Aspects, Environmental Impacts, Environmental Aspects – Impacts Analysis, Compliance Obligations, Environmental Objectives, Planning Actions to achieve Environmental Objectives.	08 Hours
Unit 3: Support – Resources, Competence, Awareness, Communication – Internal and External Communication, Documented Information – Creating and Updating, Control of Documented Information, Operation – Operational Planning and Control, Emergency Preparedness and Response.	07 Hours
Unit 4: Performance Evaluation – Monitoring, Measurement, Analysis and Evaluation, Evaluation of Compliance, Checklists, Calibration and Records, Standard Operating Procedures, Work Instructions.	08 Hours
Unit 5: Internal Audit, Internal Audit Programme, Terms and Definitions, Principles of Auditing, Managing Audit Programme, Audit Activities, Audit Checklists and Reports, Competence and Evaluation of Auditors.	08 Hours
Unit 6: Management Review - Need, Role of Management Representative, Role of Top Management, Improvement, Nonconformity and Corrective Action, Continual Improvement.	06 Hours

Textbooks:

1. International Standard ISO 14001:2015 – Environmental Management Systems – Requirements withGuidance for Use
2. International Standard ISO 14004:2016 - Environmental Management Systems - General guidelineson implementation
3. International Standard ISO 19011:2018 – Guidelines for Environmental Management System auditing.

Reference Books:

1. Environmental Management Systems Auditors Course Manual by Confederation of Indian Industries.

Class: B. Tech Civil and Environmental Engineering **Title of the Course:** Project Management **Course No.:** UCEPE0816	**L**	**T**	**P**	**Credits**
	03 hours per week	---	---	03

Course Pre-Requisite:

Students must have basic knowledge about fundamentals of science. Basic mathematical ability, units & fundamentals of engineering projects.

Course Description:

The purpose of the course is to impart fundamental knowledge in the following concern

- Understanding various components of project management
- Applications of planning & organizing in Project Planning
- Understanding use of various techniques in project planning & scheduling.

Course Learning Objectives:

1. Acquire knowledge of essentials of Project Management.
2. Learn the Components of Project Management.
3. Identification & Analysis of Risk
4. Learn planning & organizing in Project Planning.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Explain the basics of project management, project life cycle, roles, and types of projects.	Cognitive (Understand) L2
CO.2	Apply risk management, quality control, TQM, and value engineering concepts in projects.	Cognitive (Apply) L3
CO.3	Use project execution and control techniques including lean construction and BIM.	Cognitive (Apply) L3
CO.4	Solve project-related optimization problems using Operations Research techniques.	Cognitive (Analyse) L4

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO.1	3	2			2						
CO.2	3	2	1								
CO.3				1	2					2	
CO.4					1					2	2

COs	**PSO1**	**PSO2**
CO.1	-	-
CO.2	-	2
CO.3	-	2
CO.4	-	1

Assessments:

Assessment	**Weightage (Marks)**
ISE-1	10

MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit: 1Basics of Project Management Introduction, Need for Project Management, Project Management Knowledge Areas and Processes, The Project Life Cycle, The Project Manager (PM), phases of Project management, Impact of Delays in Project Completions, understanding the difference between projects and programs. Types of projects.	07 Hrs.
Unit :2 Project Risk Management Introduction, Risk, Risk Management, Role of Risk Management in Overall Project Management, Steps in Risk Management, Risk Identification, Risk Analysis, Reducing Risks	07 Hrs.
Unit :3 Project Quality Management and Value Engineering Introduction, Quality, Quality Concepts: - Quality Control & Assurance, TQM in construction, Value Engineering	07 Hrs.
Unit :4 Project Execution and Control Introduction, Project Execution, Project Control Process, Purpose of Project Execution and Control. Introduction to lean construction & BIM in construction sectorCase Studies in Project Management	08 Hrs.
Unit :5 Optimization Techniques Definition and phases of O.R. Model building, various types of O.R. problems. Linear Programming Problem (L.P.P.): Mathematical formulation of the L.P.P, graphical solutions of L.P.P. Simplex method for solving L.P.P.	08 Hrs.
Unit :6 Transportation and Assignment Problem Transportation Problem: Initial solution by Northwest corner rule, Least cost method and Vogel's approximation method (VAM), MODI's method to find the optimal solution, special cases of transportation problem. Assignment problem: Hungarian method to find optimal assignment, special cases of assignment problem	08 Hrs.

Textbooks:

1. Project Management & Control by P.C.K.RAO
2. Project Management by S.Chaudhary.
3. Jack Gido, James P Clements, Project Management, Cengage Learning India Pvt. Ltd., 2nd Reprint 2011, ©2007

References:

1. Project Management by William G Ramroth
2. Project Management by Harvey Maylor
3. Project Management by Paul Roberts

Class: Final Year B. Tech Environmental Engineering **Title of the Course:** Environmental Social Governance (PE-V) **Course No.:** UCEPE0817	**L**	**T**	**P**	**Credit**
	03 hours per week	-	-	3

Course Pre-Requisite:

- Understanding of Environmental Systems
- Environmental Policy and Regulations
- Environmental Impact Assessment (EIA)
- Pollution Prevention and Control technologies.

Course Description:

This course introduces students to the principles and practices of Environmental, Social, and Governance (ESG) and their relevance to environmental engineering. ESG is increasingly recognized as a framework for assessing and managing environmental and social risks, promoting sustainability, and enhancing corporate governance. Through a combination of lectures, case studies, and discussions, students will explore key concepts, frameworks, and tools related to ESG, with a focus on their application in environmental engineering contexts.

Course Learning Objectives:

1. To Recall and define fundamental ESG concepts and terminologies
2. To Demonstrate understanding of the role and importance of ESG in the engineering sector.
3. To Apply ESG criteria in assessing the environmental and social impact of engineering projects.
4. To Analyze and evaluate the effectiveness of ESG strategies in real-world engineering case studies.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Define and Explain fundamental ESG concepts and terminologies	Cognitive (Remembering) L1
CO.2	Demonstrate understanding of the role and importance of ESG in the engineering sector.	Cognitive (Understanding) L2
CO.3	Apply ESG criteria in assessing the environmental and social impact of engineering projects.	Cognitive (Applying) L3
CO.4	Analyse the effectiveness of ESG strategies in real-world engineering case studies.	Cognitive (Analysing) L4

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2	1	–	–	–	2	–	–	–	–	–
CO2	2	2	–	–	–	3	2	–	–	–	–
CO3	3	2	3	–	1	3	–	–	–	–	–
CO4	2	3	2	–	–	3	1	–	–	–	1

COs	**PSO1**	**PSO2**
CO1	2	1
CO2	2	1
CO3	3	2
CO4	2	2

Assessments:

Assessment	**Weightage (Marks)**
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions etc. (For each ISE two different tools are to be used).
- **MSE:** Assessment is based on 50% of course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Introduction to ESG Principles and Frameworks: Overview of Environmental, Social, and Governance (ESG) concepts, Importance of ESG in corporate sustainability and responsible investing, Evolution of ESG frameworks and standards (e.g., Global Reporting Initiative, Sustainability Accounting Standards Board), Principles of sustainable development and triple-bottom-line (TBL) accounting.	**07 Hrs.**
Unit 2: Environmental Aspects of ESG: Assessment and Management Environmental considerations within ESG frameworks, Methods for assessing environmental impacts (e.g., Life Cycle Assessment, Environmental Impact Assessment), Environmental management approaches (e.g., pollution prevention, resource conservation, ecosystem restoration)	**08 Hrs.**
Unit 3: Social Dimensions of Sustainability: Equity, Diversity, and Community Engagement Social factors in ESG evaluations and reporting, Key social issues (e.g., human rights, labour practices, community relations), Strategies for promoting diversity, equity, and inclusion (DEI) in organizations, Stakeholder engagement and community outreach in environmental projects.	**08 Hrs.**
Unit 4: Governance and Corporate Responsibility: Ethics, Transparency, and Accountability Governance principles in ESG frameworks, corporate governance structures and best practices, Ethical considerations in environmental engineering and business decision-making, Transparency, accountability, and anti-corruption measures.	**07 Hrs.**
Unit 5: ESG Reporting and Disclosure: Standards and Guidelines ESG reporting frameworks and standards (e.g., SASB, TCFD, CDP, BRSR), Guidelines for ESG disclosure and reporting (e.g., Integrated Reporting, GRI Standards), ESG data collection, measurement, and reporting processes, Role of assurance and verification in ESG reporting.	**08 Hrs.**
Unit 6: Case Studies and Practical Applications of ESG Principles Real-world examples of ESG implementation in various sectors (e.g., energy, manufacturing, finance), Analysis of ESG performance metrics and indicators, Group projects or presentations on ESG initiatives and strategies, Discussion of emerging trends, challenges, and opportunities in ESG integration.	**08 Hrs.**

Textbooks:

1. Dyllick, T. & Muff, K., "Clarifying the Meaning of Sustainable Business: Introducing a Typology from Business-as-Usual to True Business Sustainability" — Routledge, 1st Edition, 2016 (conceptual grounding in sustainability frameworks).
2. Munshi, D. & Kurian, M., "Sustainability and Management: Insights and Innovations from the Indian Context" — Sage Publications India, 1st Edition, 2020 (ESG and sustainability in Indian context).
3. Epstein, M. J. & Buhovac, A. R., "Making Sustainability Work: Best Practices in Managing and Measuring Corporate Social, Environmental, and Economic Impacts" — Routledge, 2nd Edition, 2014 (practical ESG implementation).
4. Carroll, A. B. & Buchholtz, A. K., "Business & Society: Ethics, Sustainability & Stakeholder Management" — Cengage Learning, 10th Edition, 2019 (stakeholder and social dimensions of ESG).

References:

1. Environmental Social and Governance (ESG) investing A Balanced analysis of the theory and Practice of a Sustainable Portfolio 1st Ed by Hill and John, Elsevier Feb 2020.
2. Environmental Social Governance: Managing Risk and Expectationsby John Trudinger, Karlheinz Spitz, and Matthew Orr. CRC Press, 2022

Class: Final Year B. Tech Civil and Environmental Engineering **Title of the Course:** Hazardous Waste Management **Course Code:** UCEPE0818	**L**	**T**	**P**	**Credit**
	03 hours per week	-	-	3

Course Pre-Requisite:

Students shall know:

- Environmental Chemistry and Microbiology
- Industrial waste and wastewatermanagement.

Course Description:

This course provides comprehensive knowledge of hazardous waste generation, characterization, treatment, disposal, and regulation, with emphasis on risk-based management, sustainability, and protection of human health and the environment. The course integrates engineering principles, waste minimization strategies, treatment technologies, risk assessment, and legal frameworks, enabling students to design and evaluate effective hazardous waste management systems in industrial and municipal contexts.

Course Learning Objectives:

At the end of this course, students will

1. Differentiate hazardous waste from nonhazardous waste.
2. Learn methods to prevent hazardous waste production and tominimize its impact.
3. Gain knowledge of the physical, chemical, and biologicalmethods of treating hazardous waste.
4. Understand land disposal methods of hazardous waste.

Course Outcomes:

COs	**After the completion of the course, the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Demonstrate knowledge of the importance of hazardouswaste management	Cognitive (Understanding) L2
CO.2	Understandthe impacts of hazardous and special waste disposal on human health and the ecosystem.	Cognitive (Understanding) L2
CO.3	Advice on the environmental laws and regulations governing the management of hazardous wastes	Cognitive (Applying) L3
CO.4	Advice on suitable remedial measures to reduce the impacts of waste disposal	Cognitive (Applying) L3

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO.1	2	1	-	-	-	1	2	-	-	1	1
CO.2	2	2	2	1	1	2	3	-	-	1	2
CO.3	3	3	2	2	1	2	3	-	1	1	2
CO.4	3	3	3	2	2	2	3	-	-	1	2

COs	**PSO1**	**PSO2**
CO.1	2	1
CO.2	3	2
CO.3	3	2
CO.4	3	3

Assessments :

Assessment	**Weightage (Marks)**
ISE-1	10
MSE	30
ISE-2	10
ESE	50

- **ISE-1 and ISE-2:** Assessment is based on Assignment/Declared Test/Quiz/Seminar/Group Discussions

etc. (For each ISE, two different tools are to be used).

- **MSE:** Assessment is based on 50% of the course content (Normally first three Units)
- **ESE:** Assessment is based on 100% course content with 30% weightage for course content covered before MSE and 70% weightage for course content covered after MSE.

Course Contents:

Unit 1: Fundamentals of Hazardous Waste Definition and scope of hazardous waste; sources and generation (industrial, healthcare, mining, agriculture); classification based on ignitability, corrosivity, reactivity, and toxicity; hazardous waste characterization techniques; compatibility and flammability of chemicals; fate and transport of hazardous substances in soil, water, and air; exposure pathways; acute and chronic health effects; environmental impacts.	**7 Hours**
Unit 2: Hazardous Waste Minimization and Handling Waste minimization hierarchy; source reduction, material substitution, process modification; segregation and on-site handling; packaging, labeling, and storage requirements; hazardous waste transportation and manifest system; Extended Producer Responsibility (EPR) in hazardous and special wastes; occupational safety during handling.	**7 Hours**
Unit 3: Treatment Processes – Physico-Chemical Methods Chemical treatment processes—neutralization, precipitation, oxidation–reduction; stabilization and solidification techniques; combustion and incineration (conceptual); physico-chemical processes—soil vapor extraction, air stripping, adsorption, ion exchange; selection of treatment processes.	**8 Hours**
Unit 4: Treatment Processes – Biological and Thermal & Disposal Methods Biological treatment methods (aerobic and anaerobic); bioremediation and phytoremediation (concepts); thermal treatment processes; hazardous waste disposal methods—secured landfill design, liner systems, leachate and gas management; post-closure monitoring and long-term environmental safeguards.	**7 Hours**
Unit 5: Risk Assessment and Management of Special Wastes Concept of risk and environmental risk; hazard identification, exposure assessment, dose–response, and risk characterization (conceptual); risk management measures; overview of special wastes—radioactive waste, e-waste, plastic waste, biomedical waste; comparative risks and management strategies.	**7 Hours**
Unit 6: Legal, Regulatory, and Institutional Framework Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016; Biomedical Waste Management Rules, 2016; Plastic Waste Management Rules, 2016; E-waste Management Rules; Basel Convention and transboundary movement of hazardous waste; institutional roles; landmark hazardous waste incidents (national and international case studies).	**8 Hours**

Textbooks:

1. M. D. LaGrega, P.L.Buckingham and J.C.Evans, Hazardous Waste Management, McGraw-Hill, Inc., New York, 1994.
2. W.S.Forester and J.H.Skinner, International Perspective on Hazardous Waste Management, Mudra Offset Printers, Bajaj Nagar Nagpur, 2001.
3. G.W.Dawson and B.W.Mercer, Hazardous Waste Management, Academic Press, Inc., London, England 1987.

References:

1. Vesilind P.A., Worrell W and Reinhart, Solid Waste Engineering, Thomson Learning Inc., Singapore, 2002.
2. Guidelines for Hazardous and Other waste Rules MoEFCC (2016), Govt. of India.
3. Freeman, Harry M. Standard handbook of hazardous waste treatment and disposal.(1989).
4. Wentz, Charles A., Hazardous Waste Management. 2nd Edition, McGraw Hill, New York, 1995

Class: Final Year B. Tech Civil and Environmental Engineering **Title of the Course:** Project II **Course Code:** UCEIL0871	**L**	**T**	**P**	**Credits**
	-	-	08	04

Course Pre-Requisite:

Students shall have the knowledge of:

- Engineering Mathematics,
- Environmental Chemistry and Microbiology,
- Professional Communication,
- Research Methodology

Course Description:

Project II represents the execution, analysis, and completion phase of the final year undergraduate project in Civil and Environmental Engineering. In this course, students apply engineering knowledge, research methodology, and analytical skills to systematically investigate, analyze, and solve a real-world engineering problem identified during Project Phase – I. Working individually or in small groups under the guidance of a research supervisor, students undertake detailed technical work involving experimentation, modelling, simulation, data analysis, and interpretation of results. The course emphasizes professional practices such as project planning, documentation, ethical conduct, teamwork, and effective communication. The outcome of this phase is a complete project thesis, supported by oral and/or poster presentations, demonstrating students' readiness for professional practice, research, or higher studies.

Course Learning Objectives:

The Course Objectives are to give an opportunity to students to,

1. Acquire the ability to make links across different areas of knowledge.
2. Develop collaborative skills to present ideas clearly and coherently.
3. Formulate new scientific questions that came up during project performance.
4. Learn on their own to evaluate ideas and take appropriate actions.
5. Show a professional attitude regarding time planning, collaboration, innovation and ethical issues.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive Descriptor**
CO1	Perform extended literature review and finalize research problems and objectives	Psychomotor (Apply) L3
CO2	Conduct detailed research using theoretical, experimental, or simulation approaches	Psychomotor (Readiness to Act) L2
CO3	Analyze results and establish conclusions within the specified time frame	Psychomotor (Ability to Perform) L5
CO4	Synthesize knowledge to propose solutions applicable to real-life engineering problems	Psychomotor (Create) L6
CO5	Communicate project outcomes effectively through oral/poster presentations	Affective (Organization) L4

CO-PO-PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	–	–	–	–	–	–	–
CO2	2	2	2	2	2	–	–	–	–	–	–
CO3	2	1	2	1	–	–	–	–	1	2	–
CO4	1	2	2	–	–	2	–	–	–	–	2
CO5	–	–	–	–	–	–	–	–	3	1	–

CO	PSO1	PSO2
CO1	2	1
CO2	2	2
CO3	2	2
CO4	2	2
CO5	1	1

Assessments:

Assessment	Weightage (Marks)
ISE	50
ESE (OE)	100

- **ISE:** Assessment of 50 Marks is based on at least two Internal Oral and/or Poster Presentations.
- **ESE (OE):** Assessment of 50 Marks is based on Project/ Viva-voce/ Oral Examination.

Course Content:

The work to be completed shall consist of:

- Literature Review, Research Gap and Content.
- Objectives and Motivation.
- Research Design, Process, Methodology, Data Collection.
- Development and evaluation of links across different areas.
- Pre-tests, Results, Discussions, Findings and Limitations.

Term work:

The internal assessment and evaluation shall be based on at least two presentations highlighting following points:

- Theoretical background and literature review,
- Significance and relevance,
- Proposed objectives, work plan and research design,
- Extent of work performed and findings of the research work,
- Interdisciplinary approach,
- Application utility,
- Social, economic, technical aspects and
- Limitations and future scope.

The internal assessment and evaluation for per batch shall be done by a committee consisting of the Head of the Department, two Senior Faculty Members (Subject Experts) of the Department, Research Supervisor and Co-Research Supervisor (if any). Each project batch shall submit soft copies and hard copies of their thesis duly signed by the Research Supervisor, Co-Research Supervisor (if any), two Senior Faculty Members (Subject Experts) of the Department, Head of the Department and Head of the Institution to the Research Supervisor, Co-Research supervisor (if any), Department and Examination Section. For a pass in a Project/ Viva-voce/ Oral Examination, a student shall secure a minimum of 40% of the maximum marks prescribed for the End Semester Examination.

Class: Final B. Tech Environmental Engineering **Title of the Course:** Internship **Course No.:** UCEIL0872	**L**	**T**	**P**	**Credit**
	-	-	12	6

Course Pre-Requisite:

Students shall have the knowledge of:

- Civil Engineering and its domains, Construction Technologies and Project Management.
- Environmental Protection and Pollution Prevention Measures, Environmental Management
- Use of tools and applications in various domains of Civil and Environmental Engineering

Course Description:

Internship course is been included in the curriculum to provide the candidates the exposure to professional practices followed in the field of Civil and Environmental Engineering. Internship provides an opportunity to undergraduate students to learn the various aspects of Civil Engineering and Environmental Engineering in Industries and other organizations. Students are exposed to real problems into the field and are asked to determine the solutions.

Course Learning Objectives:

1. To understand the professional practices followed in the field of Civil Engineering and Environmental Engineering.
2. To advance with reference to skills to be used in the Civil and Environmental Engineering field.

Course Outcomes:

COs	**After the completion of the course the students will be able to**	**Bloom's Cognitive Descriptor**
CO.1	Build the knowledge base with reference to practices and measures followed in the field with reference to Civil and Environmental Engineering Domains.	Cognitive (Applying) L3
CO.2	Determine the solutions to the field problems by using differentapproaches, tools and techniques.	Cognitive (Evaluating) L5

CO-PO Mapping:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO.1	1	2	1	1	1	2	-	1	-	-	1
CO.2	2	3	3	2	3	2	-	2	1	2	2

COs	**PSO1**	**PSO2**
CO.1	2	1
CO.2	3	3

Assessments :

Assessment	**Weightage (Marks)**
ISE-1	50
ISE-2	50

ISE-1 and ISE-2: Assessment is based on Presentations and Report related to Internship

Course Contents:

The Internship course provides practical exposure to **real-world practices in Civil and Environmental Engineering**, allowing students to apply theoretical knowledge in professional settings such as industries, consultancies, government bodies, and research organizations. Students engage with on-site activities, operational procedures, project execution, environmental management practices, and problem-solving related to engineering projects. The course emphasizes understanding **field challenges, use of engineering tools, professional ethics, safety practices, and sustainable solutions** through hands-on learning and structured reporting.

Class: T.Y.B.Tech Civil and Environmental Engineering **TitleoftheCourse:Co-CurricularActivities-III** **Course No.: UCECC0831**	**L**	**T**	**P**	**Credits**
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CoursePre-Requisite:

None: This courseis open to all second-year engineeringstudents interested in enhancing their personal and professional development through co-curricular activities.

Course Description:

Co-Curricular activities are an integral part of curriculum which provides educational activities to the students and thereby helps in broadening their experiences. Co-Curricular activities can be defined as the activities that enhance and enrich the regular curriculum during the normal college hours. All Co-Curricular activities are organized with specific purpose which may be according to the nature and form of activities.Thiscourseintroducesstudentstoavarietyofco-curricularactivitiesaimedatenhancingtheir professionalandpersonaldevelopmentwithinthefieldofengineeringandtechnology.Throughpractical projects,competitions,workshops,andcommunityengagement,studentswilldevelopteamwork,leadership,communication,andtechnicalskillsare essentialforsuccessintheir careers.

CourseLearningObjectives(CLOs):

1. Toencouragestudentstoshowcasetheirintellectualandindependentthinkingskills.
2. Toimbibeasenseofconfidenceandmanagerialcapabilitiesamong students.
3. Topromotetheabilitytoworkinteam,organizeandanalyseavailable resources.
4. Tobuildresponsivenessamongstudentsaboutthesocialandculturalresponsibilities.

CourseOutcomes (COs):

Attheendofthecourse studentswillbeableto:

CO1:	**Demonstrate**theabilitytocriticallyanalyzeinformationandapplyindependentjudgment in decision-making within the context of the activity.
CO2:	**Apply**principlesofmanagementandorganizationalskillstoplan,coordinate,andexecute tasks related to the co-curricular activity.
CO3:	**Collaborate**effectivelywithpeerstoachievecommongoalsandobjectiveswithintheco-curricular activity.
CO4:	**Reflect**ontheirrolesandresponsibilitiesasmembersofadiversecommunity,fostering empathy and inclusivity.

Assessments:

Assessment	Weightage(Marks)
ISE	50

ISE: Assessmentisbasedonthestudent'sparticipationinvariousCo-CurricularActivitiesandGuidelines given in "Rules forAssigningActivity Points:Activity – Event Grade Point Scheme" Policy Document.

CourseGuidelines:

1. Students are entitled to gain academic knowledge in this fast-paced environment, but it is also necessary for them to develop their personalities in both internal and external situations.
2. Co-curricularactivitieshelpstudentsgrowanddeveloptheirpersonalities.Theseactivitiescontribute to a student's total personality development.
3. Not every student is intellectually inclined. Similarly, not all pupils are interested in co-curricular activities. Therefore, there is a need to provide a solid balance of co-curricular and extra-curricular activities in order to achieve the course learning objectives.
4. It primarily refers to intellectual, physical, emotional, and social growth that can be attained by a careful mix of academic, co-curricular, and extra-curricular activities.
5. So,keepingthecourselearningobjectivesthe"RulesforAssigningActivityPoints:Activity–Event Grade Point Scheme" Policy Document is proposed.

6. Studentparticipationisassessedandreflectedinthefinalactivityperformancereportinordertoget moststudentsinvolvedinextra-curricularactivities(GroupA)andco-curricularactivities(GroupB) as shown in Table 1 in the Policy Document.
7. All undergraduate students must choose at least ONE activity/event from each group i.e. (GroupA and B).
8. Students shall choose one activity/ event from GroupAand One from Group B that take place on-campus or off-campus.
9. Freedomshall begiven tothe studentsto takepart in morethanoneactivity under the group.
10. Studentsareexpectedtoactivelyparticipateinactivities,participateincontests,andearngrade points.
11. One student in each group must earn up to 50 grades in one semester so that they can achieve up to 100 grades in one year.
12. Gradesforeachsemesterareawardedbasedonthepointsachievedbythestudent,asshowninTable 2 in the Policy Document.

CourseStructure:*(ReferRulesforAssigningActivityPoints:Activity –EventGradePoint Scheme)*

Sr.No.	Initiatives	Criteria,ActivitiesandAssignments
1	Introduction to Co-CurricularActivities	Orientation,Induction,CourseOverview
2	NationalInitiatives Participation	Participation,AchievementLevelsandAssignedActivityPoints in NCC, NSS, Unnat Bharat/ Unnat Maharashtra Abhiyan, Ek Bharat Shreshtha Bharat (EBSB)
3	SportsandGames Participation	Participation,AchievementLevelsandAssignedActivityPoints in Sports and Games
4	CulturalActivities Participation	Participation,AchievementLevelsandAssignedActivityPoints in Music, Performing Arts, Literary Arts
5	ProfessionalSelf Initiatives	Participation,AchievementLevelsandAssignedActivityPointsin 1. TechnicalEvents/Quiz/PaperContest/ProjectContest/Model Making etc. 2. MOOC/NPTEL/SWAYAM/Courseraetc. 3. Competitions/EventsConductedbyProfessionalSocieties (ISTE, IEI, CSI, IEEE, IETE, SAE, ISRO-IIRS, SWE, ISHRAE, ASM, ISNT etc.) 4. AttendingFulltimeConference/Seminars/Exhibitions/ Workshop/STTPConductedatIITs/NITs/ReputedInstitutes/ Universities 5. AttendingFulltimeConference/Seminars/Exhibitions/ Workshop/ STTP Conducted at KITCoEK 6. PaperPresentationinNational/InternationalConferenceof High Repute 7. PosterPresentationinNational/InternationalConferenceof High Repute 8. PaperPublicationinNational/InternationalJournalofHigh Repute 9. IndustrialTraining/Internship(atleastfor04Weeks) 10. ParticipationinInstituteLevelStudent Clubs
6	Entrepreneurshipand Innovation	Participation,AchievementLevelsandAssignedActivityPointsin 1. PrototypeDevelopedandTested 2. AwardsforProductsDeveloped 3. InnovativeTechnologiesDevelopedandUsedbyIndustries 4. GotFunding fromGovernment/ Industryfor InnovativeIdeas

		5. Patent-Filed/Published/Approved/ Licensed 6. SocialInnovations
7	Leadership& ManagementofClubs/ Activities	Participation,AchievementLevelsandAssignedActivityPointsin 1. ElectedStudentRepresentativeofStudentCouncil(University Representative, General Secretary, Cultural, Sports, NSS Secretary,LadiesRepresentative,AcademicToppers,Invitee Members) 2. OfficeBearerofProfessionalSocietyChapter(ISTE,IEI,CSI, IEEE, IETE, SAE, ISRO-IIRS, SWE, ISHRAE, ASM, ISNT etc.) 3. OfficeBearerofInstituteLevelStudentClub(Developer Student Club, Gaganvedhi, Walk With World, Team Mavericks,CulturalClub,Aura,AmateurWriteClub,Rotaract Club of KIT Sunshine, Women Development and Gender EqualityCell,Shourya,LeadIndia etc.) 4. OfficeBearerofDepartmentalStudentAssociation 5. OfficeBearerofECell,DigitalContentLabetc. 6. StudentAmbassadorforMayuraAICTEIDEALab/NIDHI iTBI etc. 7. EditorialBoardMemberofAnnualMagazine 8. EditorialBoardMemberofE-Newsletter 9. MemberofGovernance Committee/Statutory Committee
8	CulminatingEventand Reflection	FinalPresentations,CourseReflection,Documentation, Assessment and Evaluation

ParticipationLevels:

1. Level:I CollegeLevel Events
2. Level:II District/Central/ZonalLevel Events
3. Level:III StateLevelEvents
4. Level:IV NationalLevel Events
5. Level:V InternationalLevelEvents

ApprovalDocuments:

1. Certificate
2. LetterfromAuthorities
3. Appreciationrecognition letter
4. Documentary evidence
5. LegalProof

Grading Scheme:

Grade Range	Grade	Academic Performance
90-100	O	Outstanding
71 to 90	A+	Excellent
68-71	A	VeryGood
65-68	B+	Good
60-65	B	Average
55-60	C	BelowAverage
50-55	D	Marginal
<50	F1	FailduetoPoor Performance